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UNIVERSITY OF CALIFORNIA,
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Three Essays: Military Base Closures and Federal Spending

DISSERTATION

submitted in partial satisfaction of the requirements for
the degree of

DOCTOR OF PHILOSOPHY

in Economics

by

Deborah A. Bielling

Thesis Committee:
Professor Amihai Glazer, Chair
Professor Linda Cohen
Professor Michelle Garfinkel
Professor Bernard Grofman

1996

The dissertation of Deborah A. Bielling is approved
and is acceptable in quality and form
for publication on microfilm:

Committee Chair

University of California, Irvine
1996

DEDICATION

To

my family and friends:
your support has not gone unnoticed

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I am also grateful to the United States Air Force for financial support and confidence in my abilities. Finally, a special thanks to my family and friends who have in one way or another given me invaluable support and assistance.

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Transportation Economics

ABSTRACT OF THE DISSERTATION

Three Essays: Military Base Closures and Federal Spending

by

Deborah A. Bielling

Doctor of Philosophy in Economics

University of California, Irvine, 1996

Professor Amihai Glazer, Chair

This work of three essays investigates government decisions. Two essays examine military base closure policies and the third essay studies the determinants of federal (defense and nondefense) spending.

The first essay develops a positive analysis of military base closure policy following an exogenous shock that increases national security. The analysis finds that, when labor resources cannot move costlessly from the military sector to the civilian sector, the optimal policy when commitments are possible is not incentive compatible in a discretionary regime. In the discretionary regime, base closure policy involves excessive employment in the military sector -- a positive bias in protection of the military.

The second essay develops an empirical model to explore congressional influence and institutional changes on military base closing decisions. The model is applied to

data of base closings announced from 1961 to 1995. The findings extend the limited empirical analysis of congressional influence on base close decisions in two ways: first by examining additional explanatory factors not previously studied and second by taking into consideration the timing of base closure decision. Using a failure time estimation procedure, it is found that both descriptive characteristics and base representation on congressional subcommittees are useful in determining which bases will remain open longer.

The final essay develops empirical models to investigate the role of constituent interests, political institutions, and vote trading behavior in decisions of both defense spending and nondefense spending across states. Using panel data from 1981 to 1992 in two-stage least square regressions, the study finds that both defense spending and nondefense spending depend on the concentration of interest groups and the organization structure of the spending decisions. Empirical evidence also suggest that vote trading behavior occurs in defense spending decisions; however, the evidence does not support such behavior in nondefense spending decisions.

INTRODUCTION

In the United States, few would argue that national defense is not a public good that must be supplied by the Federal Government. However, there is plenty of disagreement surrounding defense related decisions such as infrastructure and funding. One of the most interesting characteristic of these decisions is the conflicts that derive from the interdependence of the agents either affected by the decisions or making the decisions. This dissertation, made up of three essays, investigates government decisions for military base closures and federal (both defense and nondefense) spending. In the first essay the conflict is non-political between a nation's benevolent decisionmaker and its citizens. The second and third essays examine decisions which result from political disagreements. Each essay contributes to the literature by exploring the consequences of these conflicts.

The first essay considers the non-political conflict between a benevolent decisionmaker and the citizens of the nation. Using a two-sector model -- a military sector (consisting of military bases) which produces security and a civilian sector which produces consumption goods -- the analysis studies the equilibrium adjustment of labor resources following a favorable shock that lowers the marginal benefits of security provided by military personnel. A key feature of the model is that the

reallocation of labor resources from one sector to another is costly. Given costly adjustment, military base employees will prepare for relocation only when there is a sufficiently high probability that the government will reduce military employment. Making a credible commitment to scale down military operations would permit the government to achieve a second-best solution which balances benefits of reducing the tax burden for all workers while increasing aggregate consumption against the distributional effects that arise from the adjustment costs. However, such a commitment need not be credible -- specifically, if policy is set under discretion. In this case, the expectation that the actual level military employment will exceed that which the government announces in advance reduces the incentive of military employees to relocate. In equilibrium, the government fulfills that expectation providing a socially excessive level of protection to military employees.

The second essay examines congressional influence and institutional changes in base closure decisions. Insights from a historical overview of U.S. military base closure policies and from theoretical models of congressional behavior are used to develop an empirical model for examining base closure decisions. Using a failure time estimation procedure, the model is applied to data of base closings announced from 1961 to 1995. The findings in this essay extends the limited empirical analysis of

congressional influence on base closure decisions in two ways: firstly by examining additional explanatory factors not previously studied and secondly by taking into consideration the timing of base closure decisions. The empirical results show that descriptive characteristics and base representation on the congressional subcommittees are useful in determining the which bases will stay open longer.

Finally, the third essay examines the allocation of defense and nondefense expenditures across states by the Federal government. Following recent literature which focuses on the role of both constituent interests and political institutions an empirical model is developed to examine both economic and institutional factors in determining the states' share of federal spending. In addition, an extension to the model includes the role of vote trading behavior by exploring the relationship between different categories of spending allocated across states. The hypothesis is that composition of federal spending across states is determined by constituent interest, political-institutional structures, and vote trading behavior between lawmakers. Vote trading behavior is examined by focusing on whether, and to what extent, a change in one category of spending affects a change in another category. Using panel data from 1981 to 1992, two-stage least square regressions show that constituent interests and institutional factors are useful in determining the states' share of federal expenditures for

both defense and nondefense spending. The results also show that the defense spending decisions exhibit vote trading behavior by lawmakers; however, the empirical evidence is not so conclusive for nondefense spending decisions.

CHAPTER 1: Protecting the Military

Introduction

Analyses of the strategic considerations of international conflict identify a major obstacle to cooperation. Suppose, for example, the cooperation between two nations takes the form of disarmament. Although cooperation is by design the *ex-ante* optimal policy, when the two nations make their arming decisions simultaneously given the policy of the other nation, each has an incentive to deviate from the cooperative policy by arming. Since cooperation is not incentive compatible, it is not credible.[1] The lack of credibility, in turn, calls into question the feasibility of cooperation in equilibrium.[2] This essay analyzes a complementary incentive compatibility problem which arises from a conflict within the nation -- specifically, between the citizens of each nation and their respective governments -- reinforcing the conflict which arises between two nations.

Building on a simple two-sector model -- a military sector (consisting of military bases) which produces security and a civilian sector which produces consumption goods -- the analysis studies the equilibrium adjustment of labor resources following a favorable shock that lowers the marginal benefits of security provided by military personnel. A key feature of the model is that the reallocation of labor resources from one sector to another

is costly. Given costly adjustment, military base employees will prepare for relocation only when there is a sufficiently high probability that the government will reduce military employment. Making a credible commitment to scale down military operations would permit the government to achieve a second-best solution which balances benefits of reducing the tax burden for all workers while increasing aggregate consumption against the distributional effects that arise from the adjustment costs. However, such a commitment need not be credible -- specifically, if policy is set under discretion. In this case, the expectation that the actual level military employment will exceed that which the government announces in advance reduces the incentive of military employees to relocate. In equilibrium, the government fulfills that expectation providing a socially excessive level of protection to military employees.[3]

This result would seem to be similar to the positive bias in government expenditures relative to that considered socially efficient identified by a number of analyses in the public choice literature. One strand of this literature, with its roots in Niskanen (1971,1975), emphasizes bureaucratic objectives. The other strand, stemming from Stigler (1971) and developed by Weingast, Shepsle, and Johnson (1981) and Weingast and Moran (1983), places emphasis on legislative objectives.[4] Though different in emphasis, these analyses share the same basic logic which builds on existing political institutions and conflict among

the decision makers: from the decision maker's perspective, the benefits from government expenditures extend beyond the standard economic benefits and/or the decision maker fails to fully internalize the costs of such spending.[5]

However, in abstracting from political considerations, our positive theory identifies an alternative source of the inefficiency in the allocation of resources: it is the inability of the (benevolent) government to precommit which forces the adoption of an overly protective policy. We do not deny the importance of political institutions and conflict among decision makers. We suspect that the distortions created by existing political arrangements and those driven by the government's inability to precommit are both relevant.[6] Rather, our analysis abstracts from political considerations only to highlight the distortions created by the government's inability to precommit. On a more normative level, the analysis suggests that institutional changes which affect the decision making process so as to enhance the credibility of announced policy would be desirable.

In what follows, the next section presents the model and characterizes the steady-state equilibrium before the shock and the efficient allocation of resources after the shock, assuming no adjustment costs. Then a section introduces adjustment costs and derives the bias in protection which emerges in the discretionary regime. Finally, the last section offers some concluding remarks.

Analytic Framework

Consider a closed economy populated by a continuum of individuals, $i \in [0,1]$. Each individual allocates his labor endowment (normalized to one) to either the military sector or the civilian sector. The military sector produces "security' denoted by s subject to an external threat to the national security denoted by x. In a more fully articulated model, this threat to national security and the nation's allocation of resources would be jointly determined in a general equilibrium [e.g., Garfinkel (1990)]. However, since our focus is on the conflict within a nation, we treat x here as exogenously given without much loss of generality. The civilian sector produces consumption goods denoted by c. The only factor of production in both sectors is labor. Let μ denote the mass of labor employed on military bases and $\eta \equiv 1-\mu$ denote the mass of labor employed in the civilian sector. Though this allocation may change over time, the index to time is suppressed for notation convenience.

The production technology in each sector exhibits constant returns to scale. Imposing the labor constraint, these technologies are given by

$$c = a\,(1-\mu),\ a > 0$$

$$s = \mu - x,\ 0 \le x < 1 \qquad (1)$$

Individuals employed in civilian production are compensated

according to their own productivity: $W_i = a$ in terms of consumption goods. Workers located in the military sector are paid $W_i = W_M$ chosen by the government.

Workers in both sectors have identical preferences defined over security, s, their own consumption, c_i, and moving, Z. Specifically, the preferences of agent $i \in [0,1]$ are given by

$$U_i = \alpha \ln c_i + (1-\alpha)\ln s - \lambda_i Z, \quad 0 < \alpha < 1, \quad Z > 0 \qquad (2)$$

for each period, where $\lambda_i \in [0,1]$ negatively reflects the length of uninterrupted time individual i has not relocated. For individuals $i \in [0,1]$ who relocated at the beginning of the current period, $\lambda_i = 1$ and they incur cost Z. Over time, provided individual i remains in that sector, λ_i falls until, after a finite number of periods have passed; at this time λ_i equals 0 and remains there until the individual moves back to the other sector. This specification views the costs of adjustment as the disutility of additional effort required by the individual to adapt to a new work environment and yet be equally productive as other workers who have been employed in a given sector for some time.[7]

Assuming no borrowing or lending, individual i's budget constraint is simply

$$c_i = W_i(1 - \tau) \qquad (3)$$

where τ is the proportional income tax imposed on all workers by the government to finance military operations. Given s, τ, and the location of employment, each individual's compensation choice is dictated by the constraint in (3). Their location decision is studied below. Henceforth, we let $U(W_i(1-\tau),s)-\lambda_i Z$ denote individual i's indirect utility.

We assume that the government is a "benevolent" social planner attaching an equal weight to each individual. Specifically, the government's preferences are given by:

$$V = \int_i [U(W_i(1-\tau),s)-\lambda_i Z]\,di \qquad (4)$$

In addition, we assume that, like workers, the government does not have access to financial markets. Thus, the (benevolent) government's budget constraints implies that its current tax revenues be equal to its current expenditures. Given W_i for $i \in \eta$ and the external threat to national security x, the government's choice of the allocation of labor resources to the military sector and W_M maximizes (4), subject to this constraint and the production technology for security in (1).

The Initial Allocation of Resources

As a point of reference, consider the steady-state allocation of resources for a given external threat to national security, $x > 0$, where $\lambda_i = 0$ for all $i \in [0,1]$.

In this steady-state equilibrium, where there are no incentive for workers to move from one sector to the other, the government must compensate military workers with the wage received by workers in the civilian sector: $W_M = a$. Thus, aside from their employment location, military workers are indistinguishable from workers in the civilian sector in this steady-state. Further, the government's budget constraint implies $\tau=\mu$. Thus, each individual consumes $c=a(1-\mu)$.

Given these results, the steady-state allocation of resources solves the following optimization problem:

$$\max_{\mu}\{\alpha \ln a (1-\mu) + (1-\alpha)\ln (\mu - x)\}. \qquad (5)$$

The first-order condition to this problem implies $\mu^*(x)=1-\alpha(1-x)$.[8] Thus, consumption is given by $c^*(x)=a\alpha(1-x)$ and security is given by $s^*(x)=(1-\alpha)(1-x)$. We take this allocation as the starting point for our analysis. If there were no shock to security, these solutions would apply to the future allocation of resources as well.

The Efficient Allocation After the Realization of the Shock

Now consider a shock that lowers the threat to national security. In particular, suppose that the government learns that the external threat to be realized in the next period equals zero. Assuming momentarily that there are no adjustment costs arising from the reallocation of labor

resources (i.e., Z=0), the government's optimization problem would be identical to that specified above in (5), with x=0. It follows from the solutions derived above that military employment would simply be $\mu^*(0)=1-\alpha$; in the absence of adjustment costs, workers in the two sectors would again enjoy the same consumption: $c^*(0)=a\alpha$.

Adjustment Costs and the Reallocation of Resources

In this section with a focus on the one-shot game,[9] we study the allocation of resources following the favorable shock to national security, under the more realistic assumption that military employees who move into the civilian sector must put forth a greater effort than those who have been employed in the civilian sector for some time (Z>0). Workers, however, can prepare in advance as an imperfect substitute for previous work experience to attenuate the costs of moving $\lambda_i < 1$.

Costly Adjustment and the Location Decision

Upon learning about the lower external threat, the government notifies a fraction of military employees that they will not be employed by the government in the next period. Let n_A denote the mass of these employees. Notified workers have two options: (i) move into the civilian sector immediately or (ii) wait until the next period when the government's base closure policy is actually implemented. When a worker moves immediately, he acquires

some human capital (or training in preparation) for employment in the civilian sector. Though the move is not costless, the transition is smoother. To be more precise, $\lambda_i=\lambda_L<1$.

When a notified worker waits, he faces two possibilities. Either the government employs him (despite the previous announcement) or forces him off the base. All individuals who remain employed in the military sector receive a wage, W_M, chosen by the government. But, without any previous preparation, a worker forced to relocate in the civilian sector finds the move more costly: $\lambda_i = 1$.[10] Utility obtained in this case, $U(a(1-\tau),s)-Z$, is clearly less than that obtained if the worker had relocated immediately, $U(a(1-\tau),s)-\lambda_L Z$.

Let $n_1 \leq n_A$ denote the mass of workers who immediately relocate and n_2 denote the mass of workers, chosen by the government, who are forced to relocate in the next period from the military sector to the civilian sector. Since $\lambda_i Z$ indicates the costs of adjustment and $\lambda_L<1$, the government would prefer that all notified workers move immediately. However, their location decision will depend on their expectation of the government's decision of how many military base workers to actually retain.

Let $p \equiv n_2/(n_A - n_1) \in [0,1]$ denote the fraction of notified workers who wait but are not offered a job on any of the military bases in the next period. If the government retains $1-p$ of the previously notified workers who wait and

randomly chooses among them, then $1-p$ is the probability that a notified worker who waits can remain on the base in the next period. As such, given the location decision of others, each notified base employee will wait if and only if

$$\begin{aligned} D(n_1,n_2,n_A) \equiv\ & p[U(a(1-\tau),s)-Z]+(1-p)[U(W_M(1-\tau),s)] \\ & -[U(a(1-\tau),s)-\lambda_L Z] \\ =\ & (1-p)[U(W_M(1-\tau),s)-U(a(1-\tau),s)]-(p-\lambda_L)Z \geq 0 \end{aligned} \quad (6)$$

Without any loss of generality, we assume that the worker waits at the point of indifference.

As will become apparent below, this condition depends on n_1 and n_2 only through p. For now, observe that when the government can precommit to $n_2 = n_A - n_1$, $p = 1$ and n_A is perfectly credible. In this case, all notified workers will relocate to the civilian sector immediately, since $\lambda_L < 1$. But, as we illustrate below, the government's announcement made with the ability to precommit need not be credible in the discretionary regime.

The Government's Optimization Problem

Regardless of whether the government can precommit to its announced military base policy or not, its choice on the military base maximizes:[11]

$$V=(\mu^*-n)U(W_M(1-\tau),s)+(1-\mu^*+n)U(a(1-\tau),s)-(n_1\lambda_L+n_2)Z \quad (7)$$

where $\mu^* \equiv 1-\alpha(1-x)$ and $n \equiv n_1 + n_2$,

subject to (3)

$$s = \mu^* - n \tag{8}$$

and

$$\tau = \frac{(\mu^*-n)W_M}{(\mu^*-n)W_M + (1-\mu^*+n)a} \tag{9}$$

If the government could make binding commitments, it would effectively choose both n_1 and n_2, in the initial period along with its announcement: $n_A = n_1 + n_2$. In the more realistic case where policy is set under discretion, the government can only choose n_2 given the notified workers' relocation decision, n_1. In this case, n need not equal n_A. In either case, given the choices of n_1 and n_2, aggregate consumption is given by $c = a(1-\mu^*+n)$.

Preliminary Results

Before studying the equilibrium military base policy and the relocation strategy of notified military base workers under the two regimes of precommitment and discretion, it is convenient to characterize the government's choice of W_M as a function of the employment decisions n_1 and n_2. For both regimes given the choices of n_1 and n_2, the first-order condition relative to the wage paid to military workers implies

$$W_M(n_1, n_2) = W_M = a. \tag{10}$$

The government simply pays the remaining military base employees the wage received by workers in the civilian sector.[12]

From (9) given $W_M = a$, the tax rate again equals the proportion of the labor force who remain in the military sector:

$$\tau = \mu^* - n. \tag{11}$$

As (11) reveals, regardless of its timing, a reduction in the scale of military operations permits a one-for-one reduction in the tax rate for all workers.

Furthermore, the optimal military wage policy can be used to simplify the notified workers condition for relocation:

$$D(n_1, n_2, n_A) = \left| \lambda_L - (n_2/n_A - n_1) \right| Z \geq 0 \tag{12}$$

By calculating the partial derivatives of that condition, one can easily verify that the notified worker's incentive to wait is decreasing in (i) the mass of military workers who will be forced to relocate in the net period and (ii) the mass of workers who immediately relocate, but is increasing in the announcement, n_A. The condition in (12) implies the following relocation decision by notified workers, $\hat{n}_1$, as a function of n_A and n_1:

$$\hat{n}_1 = \begin{cases} 0 & \text{if } n_2 \leq \lambda_L n_A \\ n_A & \text{otherwise} \end{cases} \qquad (13)$$

To verify this solution, note that a necessary and sufficient condition for (12) to be satisfied is that $n_2 \leq \lambda_L(n_A - n_1)$. If this condition is satisfied for $n_1=0$, then no workers will have an incentive to move since $D(n_1,n_2,n_A)$ is decreasing in n_1.

With these preliminary results, we now turn our focus on the equilibrium in the commitment regime and then we study the equilibrium outcome in the discretionary regime.

Equilibrium with Precommitment

As mentioned previously, the ability to precommit effectively permits the government to choose n_1. Its choice of n_1 and n_2, which implies an announcement of $n_A = n = n_1 + n_2$, maximizes (7) subject to (3), (8), and (11) given (10). Substituting in these constraints, the first-order conditions relative to n_1 and n_2 respectively are

$$F(n) = \frac{\alpha x - n}{(1-\mu^*+n)(\mu^*-n)} - \lambda_L Z \leq 0 \qquad (14)$$

$$G(n) = \frac{\alpha x - n}{(1-\mu^*+n)(\mu^*-n)} - Z \leq 0 \qquad (15)$$

The conditions in (14) and (15) hold strict equality for n_1

> 0 and n_2 > 0 respectively. Let $F_j(n)$ denote the partial derivative of $F(n)$ with respect to n_j, $j = 1,2$ and $G_j(n)$ denote the partial derivative of $G(n)$ with respect to n_j, $j = 1,2$. As one can easily verify, the second-order conditions, $F_1(n) \leq 0$ and $G_1(n) \leq 0$ are satisfied as strict inequalities.[13]

The intuition underlying the optimality conditions in (14) and (15) is quite straightforward. The first term in (14) which is identical to that in (15) represents the marginal efficiency gain from displacing additional military base workers. Absent adjustment costs, the government would keep $\mu^*(0) = 1 - \alpha$ of all workers on the military base, while $\mu^*(x) - \mu^*(0) = \alpha x$ would move into the civilian sector. For $n < \alpha x$, this marginal gain is positive. The second term in each equation represents the distributional effects of additional military base workers moving into the civilian sector. In contrast to the marginal efficiency gain, these effects depends on the timing of the relocation. Increasing n_2 imposes a cost on the displaced workers as they are forced to move without any preparation: Z. Increasing n_1 similarly imposes such a cost, $\lambda_L Z$; but, since $\lambda_L<1$, the distributional effects generated by displacing additional military workers in the second period (n_2) exceeds that from displacing additional workers in the first period (n_1).

That the marginal loss depends on the timing of relocation while the marginal efficiency gain does not

implies that the conditions in (14) and (15) cannot be satisfied simultaneously as equalities. Given the higher adjustment costs with delayed relocation, it should be clear that, when commitment is possible, $n_2 = 0$.

The condition in (14) with $n_2 = 0$ and $n_1 = n$ requires that the distributional costs be balanced against the marginal efficiency gains. This condition implicitly defines the equilibrium value of $n = n_A = n_1$ as a function of $\lambda_L Z$, denoted by $\bar{n}$:

Proposition 1 *If* $\lambda_L Z < \alpha x/\mu^*(1 - \mu^*)$ *and precommitments are possible, the government chooses a second best allocation of labor resources,* $\bar{n} > 0$, *such that* (i) $\bar{n} = n_1 < \mu^*(x) - \mu^*(0) = \alpha x$, (ii) $d\bar{n}/dZ < 0$, *and* (iii) $d\bar{n}/d\lambda_L < 0$.

Proof: If the adjustment costs are not too high - i.e., $\lambda_L Z < \alpha x/\mu^*(1 - \mu^*)$, - $F(0) > 0$, implying $\bar{n} > 0$. In this case, the government announces $n_A = \bar{n}$ and commits to $n_2 = \bar{n} - n_1$ which, from (13), implies $n_1 = \bar{n}$. Part (i) of the proposition, then, follows immediately from the fact that $F(\alpha x) < 0$ and the second-order condition. Invoking the envelope theorem, differentiation of the expression in (14) with respect to Z and with respect to λ_L show that $\partial F(n)/\partial Z = - \lambda_L < 0$ and $\partial F(n)/\partial \lambda_L = -Z < 0$. Parts (ii) and (iii) of the proposition, then, follow from applications of the implicit function theorem with the second-order condition.

The ability to precommit to an announced policy, $n_2 = \bar{n} - n_1$, permits the government to induce the lower adjustment cost indicated by $\lambda_L Z$. But, even when the government can precommit, adjustment costs lower (if not remove) the government's incentive to scale down military operations. As shown in the next section, the lack of a precommitment technology lowers the equilibrium adjustment even further.

Equilibrium under Discretion

Without the ability to make precommitments, the government can credibly announce only a base closure policy that is incentive compatible given the location choices make by military workers. Here we show that the policy under commitment, $\bar{n} = n_1$ as implicitly defined by (14) is not incentive compatible. That is, once the notified workers have made their location decision, the government's choice of how many workers to employ on the base, $\mu^* - n_1 - n_2$, will be greater than under precommitment, $\mu^* - \bar{n}$.

Suppose, as before, that the government announces that in the next period it will reduce the scale of military operations; at the same time, it notifies a set of workers, n_A, that they will be asked to leave in the next period if they haven't already done so. Given that announcement and n_1, the government chooses n_2 to maximize (7) subject to (3) and (11). The first-order condition to this problem for $n_2 > 0$, given by (15), implicitly defines the government's optimal military base closure policy under discretion as a

function of Z and n_1.[14] Let that policy be indicated by $\hat{n}_2(n_1)$.

In what follows we characterize the equilibrium under discretion, $\hat{n} \equiv \hat{n}_1(n_2) + \hat{n}_2(n_1)$, as it depends on the costs of delayed adjustment Z using (13) and (15). One possibility is that the costs of delayed adjustment are too high to ensure an interior solution for $\hat{n}$ even when the condition ensuring that $\hat{n} > 0$, with $n_2 = 0$, is satisfied:

Proposition 2 *If* $Z > \alpha x/\mu^*(1-\mu^*) > \lambda_L Z$, $\hat{n} > 0$, *but no adjustments will be made in the discretionary equilibrium:* $\hat{n} = 0$.

Proof: Observe that $G(n) < 0$ for $n_1 + n_2 = 0$ if $Z > \alpha x/\mu^*(1-\mu^*)$--a weaker condition than that for $\hat{n} = 0$. Furthermore, since $G_1(n) = G_2(n) < 0$, $n_2 = 0$ for all feasible values of $n_1 \geq 0$. In turn, (13) implies $\hat{n} = 0$ for any announcement $n_A \geq 0$, thereby completing the proof.

When the condition stated in the proposition holds, p=0 for all values of n_1. Hence, each notified worker knows that, regardless of how many other workers relocate immediately, he will not be forced to move into the civilian sector if he waits; yet, if he were to relocate, the government would have no incentive to invite him back to the base as long as the condition stated in Proposition 1 is satisfied. Since $\lambda_L Z > 0$, none of the notified workers,

then relocate immediately. Thus, when the adjustment costs associated with delayed relocation, Z, are too high, the lack of a commitment technology precludes any reallocation of resources in response to the positive security shock. In this case, where protection of the military is complete, the announcement $\bar{n} > 0$ is not credible.

Now suppose $Z < \alpha x/\mu^*(1-\mu^*)$, implying an interior solution for $\hat{n}$. In this case, using (14) and (15), we can characterize the equilibrium adjustment under discretion:

Proposition 3 *Assuming* $Z < \alpha x/\mu^*(1-\mu^*)$, $\hat{n} > 0$ *in the discretionary regime,* $\hat{n} < \bar{n}$ *and* $d\hat{n}/dZ < 0$.

Proof: If $Z < \alpha x/\mu^*(1-\mu^*)$, then $G(0) > 0$. Since $G_2(n) < 0$, there exists some value of n_2 given $n_1 = 0$, $\hat{n}_2(0)$ such that $G(\hat{n}_1(0))=0$. Furthermore, since $G_1(n) = G_2(n) < 0$, the government's "reaction function" takes the form: $\hat{n}_2(n_1) = \hat{n} - n_1$, where $\hat{n} = \hat{n}_2(0)$ as previously defined [by (15)]. However, using (14) which implicitly defines $\bar{n}$ and (15), one can verify easily that $G(\bar{n})<0$ for all $n_1 \leq \bar{n}$. In turn, the second-order condition, $G_2(n)<0$, implies that $\hat{n} < \bar{n}$. Differentiation of the expression in (15) with respect to Z, using the envelope theorem, shows that $\partial G(n)/\partial Z=-1$. Thus, the remainder of the proposition follows from an application of the implicit function theorem to (15) and the second-order condition.

Proposition 3 simply states that, in the discretionary

regime, the adjustment of resources is incomplete relative to the commitment case, but positive as long as the adjustment costs are not too high. Using (12) we can easily pindown the timing of the adjustment. As in the case of commitment, under discretion the government prefers that military workers relocate immediately upon notification. To induce that voluntary adjustment by the workers, the government simply announces $n_A = \hat{n}_2(0)$, the largest value of n_2 given $n_1 = 0$ that is incentive compatible. This announcement is perfectly credible and, from (13), implies that $\hat{n}_1 = \hat{n}_2(0) = n_A$. Nonetheless, from Proposition 3, this equilibrium adjustment is strictly less than that if the government could make precommitments. Since $\bar{n}$ is decreasing in λ_L while $\hat{n}$ is independent of λ_L, it follows that the positive bias in protection is larger the smaller is λ_L.

Concluding Remarks

Abstracting from political institutions and conflict among policymakers, our analysis predicts a positive bias in military spending under the assumption that the reallocation of labor resources from the military sector to the civilian sector is not costless. In this case, upon realizing a favorable shock to national security, the government faces a trade-off in shifting labor resources to civilian production activities: though the nation can enjoy both higher security and greater consumption, the displaced military personnel are forced to accept a lower utility than those

who remain employed in that sector. If the adjustment costs are not too large, a government with the ability to precommit would choose a second-best policy that provides some protection to military personnel, while also realizing some of the increased consumption opportunities afforded by the favorable shock to national security. The government's inability to precommit leads to excessive protection of military workers -- further limiting the adjustment of resources and the increased consumption opportunities realized in equilibrium.

While our focus on a two-period model conveniently exposes the logic underlying the central result of excessive protection, it perhaps overstates the severity of the problem. In a more general, multi-period model that permits learning by doing, continuous adjustments in the allocation of resources would eventually bring us back to the efficient outcome.

Though political considerations have not been formally introduced into the model, their effects should be fairly clear. Suppose, for example, that the government values security by more than the nation's citizens. Then, the initial (steady-state) equilibrium would exhibit a positive bias in spending on military bases relative to the allocation chosen by the benevolent social planner. In this case, an exogenous increase in national security would prompt some adjustment in labor resources, but the adjustment would be sluggish and, moreover, incomplete

relative to that under a benevolent social planner. By the same token, the credibility issue discussed here should augment the distortions identified in the public choice literature. Specifically, in the context of those analyses emphasizing legislative objectives, the policymaker would fully internalize the adjustment costs generated by closing a base in his district, but would fail to account for the benefits realized by all taxpayers fully. As such, the distributional loss receives more weight in that policymaker's decision and he is less likely to follow through on an announced base closure action given that none of the base employees have prepared for that action.

The obvious normative implication of our analysis is that institutional arrangements which permit the government to make binding commitments are desirable. But, even if the government cannot make binding commitments, it can make arrangements to enhance the credibility of its base closure policy, thereby reducing the equilibrium bias in the protection of the military. Empirically, our results are suggestive of at least two government initiatives related to base closure policy in the United States. Both appear to have strengthened policy credibility.

The first is the creation of the independent Defense Base Realignment and Closure Commission (BRAC). The BRAC Commission was established (by P.L. 101-510 and its predecessor P.L. 100-526) to deliver a list of final base-closing recommendations to both the administrative and

legislative branches of government. Upon acceptance of the list by both branches, the Department of Defense (DoD) is charged with the responsibility for implementing the closure actions. The BRAC Commission was originally formed to facilitate some cooperation among governmental divisions. As suggested by the results of this paper, the BRAC Commission also facilitates coordination between the government and the base employees who should relocate. The credibility of policy is strengthened because the visibility of BRAC Commission and its recommendations increase the costs of reneging on the announced policy. Thus, employees' expectations of moving and their incentive to voluntarily move are increased.[15]

The second initiative, used during downsizing of military operations, are training programs or subsidies to base employees for participation in other educational programs to prepare for employment in the civilian sector. For example, with the major base closure announcements of November 1964, a nation-wide priority placement program for displaced DoD personnel was established, guaranteeing career DoD employees, who lost their job due to a base closure, assistance in finding employment elsewhere. Another example is Project Transition, a DoD program designed to ease the move of military personnel to civilian life during the Vietnam drawdown. This program offered job counseling, vocational training, educational opportunities, and job placement services. More recently, in conjunction with

current base closure announcements, DoD has made several relocation programs available for its employees, including the Defense Outplacement Referral System to help employees find jobs off the base and the Defense Conversion Assistance which gives displaced employees grant money for college tuition and retraining assistance. By reducing the costs borne by military base employees who relocate, such programs can increase the credibility of the government's general policy to scale down military operations.[16]

One interesting and important extension of the analysis is to treat military spending by other nations as endogenous. We conjecture that, insofar as the incentive of each nation to arm depends positively on the level of spending by other nations, any program that enhances the credibility of one nation's base closure policy would imply less military spending by the other nations as well in a non-cooperative equilibrium.

CHAPTER 2: Dynamics of Base Closures: An Empirical Analysis

Introduction

Closing domestic military installations affects several interrelated groups. First, the communities and base workers who want to maintain income from base employment; second, the voters who want their taxes spent as efficiently as possible; and finally, the policymakers who must decide which, if any, bases to close. Conventional wisdom says that Congress or the bureaucracy, in pursuit of their own self-interest, will not, without some extraordinary organizational constraints, close all unnecessary military bases. This prediction follows from theoretical models of policy outcomes, as discussed in the previous chapter, that address redistributional issues involved in the supply of public goods.

In other words, in deciding the level of national defense, policymakers must also decide where to build and raze military bases. While the benefits of national defense are shared by all citizens, there are additional implications -redistributional effects- of military base decisions. Specifically, citizens with an interest in the base (e.g., local employees and suppliers) are also impacted by the redistibution of taxes - they obtain additional benefits from an opening decision or additional costs from a closing decision. In the case where Congress is the policymaker, theory predicts that individual legislators,

rationally pursuing their own interest in maintaining benefits for their constituents, will protect bases located in the geographical areas they represent.

In this essay I examine congressional influence and institutional changes in base closure decisions. I first provide a historical overview of U.S. military base closure policies. Second, I review theoretical models that offer insight to congressional behavior and highlight the characteristics of these models to base closings. I then use the literature in development of an empirical model for examining base closure decisions. The model is applied to data of base closings announced from 1961 to 1995. The findings in this essay extends the limited empirical analysis of congressional influence on base closure decisions in two ways: firstly by examining additional explanatory factors not previously studied and secondly by taking into consideration the timing of base closure decisions.

U.S. Military Bases and Closure Policies

Military installations located in the United States involve a significant amount of the country's national defense labor force and government funding. To illustrate, in 1991 over two million people were employed at these facilities; payroll and operations expenditures were approximately 32 percent of defense outlays, more that 6.5 percent of the total federal outlays. During times of

military disengagement or to cut government cost, policy decisions are made to realign or close military installations.

These decisions have a substantial impact on the allocation of the resources. For example, closures in the 1960s included the release of nearly two million acres of defense land and the elimination of approximately 215,000 defense jobs (Daicoff, 1972). In 1993, closure of nine bases in California were estimated to cost the state 80,000 jobs and $4.5 billion in lost wages (The Christian Science Monitor, 1993).

The United States base closure policies, from 1961 through 1995, can be separated into three distinctive periods.[17] During the first period, from 1961 to 1979, closure actions at major military bases occurred throughout the period after many unevenly timed announcements. During the second period, from 1980 to 1987, no major bases were formally announced for closure. This was followed by the final period, from 1988 to 1995, where legislation was enacted which explicitly specified the timing of base closure announcements.

Timing of announcements is not the only attribute of each period. Other characteristics include fiscal policy, foreign-military threats, and decisionmaking procedures.[18] In describing these characteristics I use the following factors: (a) the Department of Defense (DoD) outlays, (b) the signing and ratification of Soviet-American bilateral

arms control and disarmament agreements, (c) the bureaucratic structure responsible for identifying which bases to close, and (d) the Congressional legislation in effect to "veto" closure proposals.[19]

In the early period DOD outlays as a percent of federal outlays were declining, from 50.8 percent in 1961 to 23.1 percent in 1979.[20] The United States and the Soviet Union entered into several agreements to reduce the risk of nuclear war, limiting both nuclear testing and the number of nuclear weapons.[21] Also, throughout most of this period, final decisions on base restructuring were made in the Office of the Secretary of Defense where lists of base closure and realignment actions were routinely released. However, Congress incrementally enacted a series of legislation that increasingly restricted the ability of DoD to implement the closure actions.[22]

During the second period the defense budget was growing in real terms from 22.7 percent of the federal outlays in 1980 to 28.1 percent in 1987. No Soviet-American bilateral arms control and disarmament agreements were signed and ratified. Military base restructuring decisions were delegated to the military departments where the closure policy was less aggressive than that observed in the first period (Thompson and Jones, 1994, page 197). Here few bases were identified for possible closure or realignment (Twight, 1989, page 78-79). Congress was reluctant to support the actions and, in general, unwilling to fund projects

necessary for base closures.[23]

In the final period defense outlays declined from 27.3 percent of federal outlays in 1988 to 17.2 percent in 1995. The United States and the Soviet Union again entered into bilateral arms control and disarmament agreements.[24] Congress established an independent, bipartisan, narrowly scoped commission to identify military bases for closure. Legislation authorized first one, followed by three more, rounds of base closings.[25] Each round had its own commission. The commission would recommend a "package" of installations for closure or realignment actions. Congress could only vote up-or-down for the entire package and not for any base separately. After each round of decisions, the commission was effectively dissolved.[26]

To summarize, U.S. military base closing policies involve a significant amount of the country's national defense resources. It is convenient to separate the base closure policies from 1961 to 1995 into three time frames. The first period (1961-1979) was one where DoD funding was contracting, multiple bilateral arms agreements were put into force, a central bureaucratic office made unevenly timed base closure decisions, and Congress had "limited veto power." In the second period (1980-1987) funding was expanding, no bilateral arms agreements were signed and ratified, decentralized bureaucratic offices identified few bases for closure, and Congress had "unlimited veto power." During the final period (1988-1995) funding was again

contracting, bilateral arms agreement were signed and ratified, a special bureaucracy was temporarily established to decide which bases to close, and Congress restricted its "veto power" over those closures.

Obviously each of the factors -- the domestic budget, the external threat, and the government decisionmaking process -- may support a plausible explanation of the overall base closure policy during each period. For this essay I focus on government decisionmaking and in the next section discuss theoretical underpinnings.

Theoretical Underpinnings of Base Closure Decisionmaking

At least two broad theoretical literatures are useful in identifying underpinnings of government decisionmaking that apply to base closure policies. They both offer insights into congressional actions and the observed policy outcomes.

Distributive Politics

First, base closings seem to conform with the theoretical literature of distributive politics. Models of distributive politics apply when decisions result in the concentration of benefits (or costs) and the dispersion of costs (or benefits) (for example see Weingast, Shepsle, and Johnsen, 1981). Typically, the models emphasize the politician's geographical constituency. Reelection is stressed as a principle goal for self-interested politicians

to obtain local benefits for their constituents (Ferejohn, 1974; Mayhew, 1974; Fiorina, 1989; Weingast, Shepsle, and Johnsen, 1981; and Cox and McCubbins, 1993). It is assumed that closing a military installation results in lost benefits (reduction of jobs and income to the geographical location associated with military bases). Therefore, the politicians who can prevent the base(s) they represent from closing would be responsive to the interests or preferences of the citizens and be rewarded with reelection.

In practice Congress does not identify bases for closure; instead these decisions are determined by bureaucrats. However, through "oversight" (monitoring, rewarding, and punishing bureaucratic behavior) and administrative procedures (defining the structure and process for the decisions) Congress may be able to control bureaucratic decisions.[27] Although not overwelmingly accepted evidence, empirical studies of distributive politics suggest that Congress may influence bureaucratic decisions (for examples see Arnold, 1979; Weingast and Moran, 1983; and Weingast, 1984). There are several possible mechanisms for this influence; some important ones will be discussed below.

Collective Action Problems

A second theoretical literature useful for discussing base closings is related to collective action problems. These problems occur when action taken by individuals,

acting in their own interest, lead to outcomes that do not promote the public interest.[28] When closing bases Congressional policymakers may face collective action problems during periods of "unlimited veto power" - i.e., the period from 1980 to 1987. This theory offers an explanation for no base closures in the second period and also provides a reason why Congress would delegate base closure choices to a commission in the third period.

Specifically, it seems that when Congress does not support closure actions and is unwilling to fund projects necessary for closure, they have established a structure where no base closures occur. This structure, which I refer to as "unlimited veto power," may provide individual legislators a means of stopping bases from being shut down. The individual legislators rationally pursue their own interests by engaging in actions to keep bases in their districts open even though the collective result of such behavior - excessive base infrastructure and inefficient use of taxpayers money - are not preferred by any of the them.[29] To solve this collective action problem, Congress not only delegates the base closure decisions to a commission but also severely weakens its own veto power.

These two theoretical literatures predict that Congress may be able to influence bureaucratic base closure decisions. Thus, the empirical question is: Did Congress influence bureaucratic (DoD and commission) base closure decisions? Before I describe the empirical model to examine

this question, I discuss several possible mechanisms for Congressional influence.

Mechanisms for Congressional Influence[30]

The literature on Congressional influence identify different political factors that may be used to ensure that bureaucratic decisions remain as close as possible to those that the elected officials would make themselves. In what follows, I describe several of these factors that may act as mechanisms for congressional influence: congressional committees, political parties, and seniority.

Congressional Committees

The conventional wisdom on the postwar Congress is that legislation is the result of "committee government" and more recently "subcommittee government." Two features of the committee system account for its influence over policy choice. First, the fragmentation of policy issues into groups or jurisdictions and designating a set of issues to each committee gives the committees certain responsibilities and rights over specific policy areas. The rights include near-monopoly power over proposals to alter policy and complete veto power over proposals made by others. This agenda power gives committees extraordinary influence. Even though committees are constrained by majority rule, a wide range of alternatives allow committees to favor the one they most prefer (Shepsle and Weingast, 1981 and 1987).

Second, committee membership is generally determined from the requests of members seeking assignments (Smith and Deering, 1984). Members typically gain influence over a set of issues relevant for their reelection. This accounts for the striking parallel of committees and policy benefits (Weingast, 1984; and Weingast and Marshall, 1988). Members from farming districts dominate the agriculture committees and oversee programs that benefit farmers. Members from urban districts sit on banking, housing, and welfare committees that provide benefits to urban constituents. Members with large defense installations or industries dominate the Armed Services committees. Committees disproportionately composed of representatives can provide benefits to their constituents and exercise great control over policies within their jurisdiction.

Several empirical studies support the hypothesis that membership on committees and benefits from public policies are positively related (e.g., Plott, 1968 on urban renewal projects; Goss, 1972 on defense related benefits; and Ferejohn, 1974 on public works decisions). However, the positive relationship between committee policymakers and benefits to their constituents is not always supported. Examples of weak or nonexistence relationships are identified in Faith, Leavens, and Tollison (1982); Rundquist (1983); and Archer (1983).

Recent analyses of legislator's "influence" focus on the "principal-agent" like relationship that can occur

between the Congress and its agents.[31] Several studies provide evidence that agencies are responsive to members of Congress. Weingast and Moran (1983) show how a mix of cases at the Federal Trade Commission changes in response to changes on the relevant oversight committees in Congress; and Moe (1985) shows that congressional committees play an important role in the determination of cases at the National Labor Relations Board. These studies view the congressional committee system as the key institutional link between interest groups and the provision of benefits.

Parties

Although congressional committee assignments are the responsibility of the Democratic and Republican parties in each chamber, the literature is divided on the significance of any influence that parties may have in policymaking. On the one hand, as Weingast and Marshall (1988) argue, parties were strong around the turn of the century when they provided reward systems and sanction mechanisms to control the behavior of lawmakers. For example, party organizations determined the positions of power within the legislation and the distribution of legislative benefits only to representatives who supported party measures. However, since these conditions no longer hold, parties now place no constraints on the behavior of individual representatives.

On the other hand, a different view is expressed by Kiewiet and McCubbins (1991) and Cox and McCubbins (1993).

They focus on the label and policy preferences that parties provide as important electoral assets for most members of congress. For example, the majority party may have a substantive advantage for members simply by structuring the committee system - setting up jurisdictions, allocating resources, and assigning members - and then letting things proceed on "automatic pilot." The argument goes, similar to the principal-agent analysis of the congressional committee system, parties provide a link between constituents and the provision of benefits.

Seniority

The seniority system in Congress is described as a way of either lowering the costs of organizing the legislature or ensuring continuity of a legislature's output.[32] As explained by models such as those of Koford (1982) and Weingast and Marshall (1988), the seniority system enables senior members of the legislature to act as brokers in the vote trading process and receive part of the gains from trade as compensation. The persistence of the seniority system may be due to its ability to act as a mechanism that enhances the probability of reelection for legislators who can provide constituent benefits (Holcombe, 1989; and Roberts, 1990). This relationship between seniority and distributive benefits is intuitively attractive and often bolstered by anecdotes. However, the empirical evidence is divided. For example, studies by Ray (1980) and Greene and

Munley (1981) report no systematic relation between seniority and the distribution of federal spending, while Crain and Tollison (1977) find a significant relation. Roberts (1988) who focuses on the 1983 death of Senator Henry Jackson, chairman of the Armed Service Committee, also finds evidence for the relationship between committee seniority and distributive benefits.

Typically, discussions of the seniority and benefits relationship are in terms of the leadership positions acquired as a consequence of seniority that provide the potential for reallocating federal benefits (e.g., committee chairs). However, the seniority and benefits relationship may also result from the legislator's familiarity with the institutions of the policy process and the experience of bargaining and rule manipulation that (regardless of leadership position) naturally accompany relatively longer tenures in office.

Empirical Analysis

This section identifies several problems with previous empirical research and suggests a more appropriate method to study base closure decisions. A brief introduction to the econometric analysis used in this essay is given, followed by a discussion of the specific model and the hypothesis examined.

Problems with Previous Empirical Research

Empirical research of military base closures has addressed congressional influence and the closure decisions. Specifically, Arnold (1979) studied base closure decisions for the period 1952 to 1974 and provides statistical evidence that House military committee members were influential in the decisions. One the surface, this evidence suggests that congressional influence was effective during the first period of base closures and not the last.

However, the congressional influence studied was limited to membership on House committees and did not examine either party influence or seniority influence.[33] In addition, although the study used conventional statistical analysis which may be useful as a rough approximation in describing the base closure process, there is reason to be skeptical of the results.

In Arnold's study it is assumed that the probability of each closure decision is unrelated to changes in the proportion of closures occurring through out the time period studied. In other words, by combining the data and disregarding the timing of each closure decision it was assumed that the proportion of bases closing at the beginning of the sample period is the same as the proportion of closures at the end of the sample period; each base had the same probability of being selected for closure. However, this assumption does not seem plausible. First, the number of closures changed over time (e.g., many bases

were selected for closure after the Vietnam War but none were identified for closures during the period from 1979 to 1988) and, second, the bases available for closure selection are conditioned on the premise that they were not previously selected for closure. Thus a more appropriate econometric model is one which considers the timing of the decision, a model that assumes the closure decision is a conditional probability. A hazard (or duration) model using a failure rate estimation procedure provides such an assumption; where the failure rate (sometimes called the hazard rate) is the conditional probability that a base is selected for closure in time period t, given that it was not selected by time period t-1.[34]

Introduction to Hazard Models [35]

Hazard models have been used by researchers in medicine and engineering for decades. Typical applications include studies of drug effectiveness and analysis of machine reliability. Recently economist have used the models to study events of interest to include unemployment, strike duration, adoption of technology such as automatic bank tellers (Hannan and Mcdowell, 1984 and 1987) and computer numerically controlled machines (Karshenas and Stoneman, 1993), and closing of steel industry plants (Deily, 1991). The literature contains quite a bit of terminology. As a point of reference, I will define the basic concepts used in this paper.

Hazard models examine the movement, or transition, of economic agents (i.e., individuals, firms, etc.) among a set of "states."[36] A state describes an activity or event with a well defined end point. The agent is only in one state at any one time. For example, a hazard model might be used to analyze the time until an employee is promoted with two possible states: Waiting for promotion and Promotion. In this essay an "agent" is a military base that is in one of two states: Selected for closure or Not.

The dependent variable of interest in a hazard model is the length of time that elapses until the agent moves into a different state. Observations typically consist of a cross section of data where "measurements" are taken at different points in time about a hazard process while it is ongoing. A pervasive problem is that the agent may not move to another state during the period of observation or even during the period of study. This is known as censoring which can be divided into two types. "Left-censoring" is when an agent is in the current state before the period of observation begins (and it is unknown when the state was entered). The duration in the initial state is at least the observed time, but not equal to it. "Right-censoring" occurs when the agent does not leave the current state during the period of observation. Use of a hazard model can account for the censored nature of the data.

When analyzing the length of time before an event occurs it may be reasonable to assume that the process is

affected by or conditioned on a set of covariates (the counterpart to regressors or independent variables in regression analysis). These explanatory variables usually describe the heterogeneity of the units being observed. The covariates can be constant (time-invariant) or change during the interval of time studied (time-varying).[37] In general the hazard rate function, which describes the conditional probability distribution of the failure times, depends on the covariates even though its shape is not effected by the covariates.[38] In other words, the hazard rate function is implicitly a function of the covariates and can be useful in assessing the dependence of failure time on explanatory variables.

The Estimation Procedure

A common approach in the econometric literature is to introduce explanatory variables into a hazard model. There are several forms of hazard models; the choice of which one to use depends on the assumed distribution of the hazard rate function. In this study I am not interested in the underlying failure time distribution but want to analyze the impact of covariates on the hazard rate. The proportional hazard model is useful for this purpose. Specifically, the Cox proportional hazard model, used to analyze the time until a base is selected for closure, provides a method of estimating the covariates affect without estimating the parameters of the hazard model. A positive coefficient on a

covariate means that a higher covariate is linked to a higher hazard rate and therefore a shorter survival time. Similarity, a negative coefficient means a covariate results in a lower hazard rate and therefore a longer survival rate.

Here I assume a proportional hazard model is an example of the relationship between the conditional probability of a base closure decision and various explanatory variables relevant to period t decisions. Let $\lambda(t;\mathbf{z})$ represent the hazard rate function at time t for a single military base with $\mathbf{z}$, a vector of explanatory variables relevant to period t. I assume that the variables include both time-invariant and time-varying covariates. The proportional hazard model is

$$\lambda(t;\mathbf{z}) = \lambda_0(t)\exp\{\mathbf{z}(t)\boldsymbol{\beta}\}$$

where λ_0 is an arbitrary unspecified baseline hazard function and $\boldsymbol{\beta}$ represents a vector of coefficients.[39] With the proportional hazard model I will use the covariates listed in Table 1.1 and described below.

The Covariates of Interest

Here I discuss the variables of interest and the expected effect of each variable on the hazard rate, or how the variable will change the length of time a before a base is selected for closure. Specifically, there are seven descriptive variables that relate to the base and its

TABLE 1.1 Data and Sources for Base Closure Model

Covariate	Source[1]
Descriptive Variables	
Base Acreage	President's Economic Adjustment Committee Reports, DoD Base Structure Reports,Army Time's Guide to Army Posts
Military Function	DoD Base Structure Reports, DoD Distribution of Personnel Reports
Economic Impact	Statistical Abstract of the U. S.
Persons Employed	DoD Distribution of Personnel Reports
Service	DoD Distribution of Personnel Reports
Pool of Bases	DoD Distribution of Personnel Reports
Coastline	The World Almanac
Congressional Variables	
House and Senate Armed Services[2]	Congressional Directory and Congressional Quarterly Almanac and The Almanac of American Politics
House Appropriations Military Subcommittees	
House and Senate Seniority	
House and Senate Majority Party	
Commission Variable	
Commission	Defense Base Closure and Realignment Commission Reports
Other	
Year of Closure Announcement	DoD News Release, and Defense Base Closure and Realignment Commission Reports

[1] From various years.

[2] Name changed to National Security Committee with the 104th Congress.

location, eight variables for congressional influence, and one variable to indicate involvement of the commission.

The seven descriptive variables are to help explain base closure decisions. First, **base acreage** measured by the total acreage of the installation (in thousands). This variable represents the availability of land for military training, a fundamental reason for military installations. Large installations also offer room for consolidations as the military base structure shrinks. The larger the base, the less likely it will be selected for closure. Therefore, I expect a negative relationship between the size of a base and the probability of selecting the base for closure.

Second, **military function** measures the relative importance of various military missions; it is a dummy variable which takes the value of one if an installation's mission was declining in relative size at the service level and a value of zero otherwise.[40] The hypothesis is that, all else being equal, bases with declining missions are more likely to be selected for closure than bases without declining missions. A positive sign is predicted for this variable.

Third, defense spending by state divided by state population is used to control for the **economic impact** on regions where a closure may occur. This variable is measured by defense spending (to include payments for payroll, supplies, services, and construction) per capita in each state. The greater the ratio the greater the economic

impact. Since base closures are commonly believed to deteriorate economies and because this is one of the selection criteria for recent base closing decisions, I expect a negative relation between this variable and the closure decision.

Fourth, the number of **persons employed** at the base. This variable tests the hypothesis that the more people employed at a base the less likely the base will close. This hypothesis follows from Down's (1957) proposition that "the citizens who are best informed on any specific issue are those whose income is directly affected" by the issue. Down's argues that when the government formulates policy it does so to please as many voters as it can. The case of base closures seems to fit Down's scenario: the government, knowing that a citizen's income is affected and that the citizen can trace the effects specifically to the government's decision, gives full consideration to the impact of its policies on the citizens. The proposition predicts that the more employees on a base, the longer the government will keep the base open. I expect a negative sign on this variable.

Fifth, a variable to identify the **service** that owns the base is use to control for any differences between the bases that might be related to the different military departments. For example, each department has its own priorities in spending decisions for the operation and maintenance of its bases. This may result in such differences as the condition

of facilities and the value of the base. In so much as a decision to close a base may be related to these kinds of differences, this variable will be useful. However, I do not predict its sign.

Two final descriptive variables have to do with the state where the military base is located. They control for the state's "propensity" to have military bases. The sixth variable is related to the number of bases in a state at the beginning of the study, measured by the number of bases in the state in 1959. Since a larger **pool of bases** to choose from can result in more closures, it is hypothesized that states with more bases at the beginning of the study are more likely to have increased closures. A positive sign is expected on this variable. The seventh variable is related to the location of the base, measured by the length of the state's **coastline**. Since it may be true that states with coastal borders are a "first line of defense" and are also closer to where the military may deploy, it is expected that bases in states with more coastline are more likely to stay open than bases in states with less coastline. A longer coastline should decrease the hazard rate and a negative sign is expected on this variable.

Each **committee variable** is a dummy variable which takes the value of one if an installation is represented on a particular committee and zero otherwise. The committees will include the House and Senate Armed Services Committees, and the military subcommittees (Defense and Military

Construction) of the House and Senate Appropriations Committees. Assuming congressional committees have influence over base closure decisions, a base represented by a congressmember who serves on one of these committees is less likely to close than a base without such representation. It is predicted that this variable would decrease the hazard rate and a negative sign is expected.

To measure the dominance of the **majority party**, I use two dummy variables, one for the House and one for the Senate. The House variable takes on a one if the member representing the base is a member of the House majority party. The Senate variable takes on the values zero, one, or two to account for the number of senators that belong to the Senate majority party. For example, closure decisions made in the years that the Democrats controlled the House and the Senate will be coded with a one for House party if the base is represented by a Democrat representative and coded with a one for Senate party if only one of the state's senators are Democrat. Since the literature is not clear how the majority party will influence policy decisions, I do not make a prediction for the sign of these variables.

Two variables are used to measure **seniority**, one for the House and one for the Senate. In the case of the Senate, where there are two people to represent each base, I only include the most senior member. The number of years the member has served in the House or Senate will be used for this variable. If seniority is important, then bases

represented by more senior congressmembers (even if not on a committee) may be saved from closure; the variables measuring seniority will be negatively related to base closure decisions.

Lastly a dummy variable is used to capture any difference between base closure decisions made by a **commission** and ones made by the DoD. The variable will take on a one if the decision was made during or after 1988. It is expected this variable will indicate whether or not decisions made by the commission contributed to the likelihood of a base closure. A positive result implies bases are more likely to be closed when the decision is made by the commission.

Data

Ideally, a dataset would include a complete history of each potential closure as well as all the characteristics which influence closure decisions over a sufficiently long period beginning with the first base closures. However, such an ideal dataset is just that, an ideal. The data used here were obtained from different documents where the level of detail and the dates were not always identical but could be grouped into discrete intervals. Useful information covering the years military bases were announced for closure was available for a sample of 402 installations. Sources used in this study are listed in Table 1.1.

Specifically, panel data that includes time-varying and

time-invariant factors were compiled for two year intervals when bases were announced for closure - from 1961 to 1979 and from 1988 to 1995.[41] The 402 installations represent approximately 78 percent of the domestic bases open in 1959. The sample includes 172 (about 75 percent) of the bases selected for closure during the period from 1961 to 1995. Over the period of study, measurements on the 402 installations were obtained such that 3795 observations are used in the analysis that follows. A distribution of the sample among the states and summary statistics of the sample are shown in Appendix Tables A-1 and A-2 respectively.

Results

The results of the proportional hazard estimations are shown in Table 1.2.[42] The dependent variable, **studytime**, is the number of two year intervals from the beginning of the study period to the interval of time the observation is recorded.[43] Bases not selected for closure by the year 1995 are treated as censored observations. Equation (1) includes descriptive variables only; equation (2) adds the congressional variables; and equation (3) incorporates the commission variable. The sign on the estimated coefficients reflect how the covariates affected the hazard rate, the time until a base is selected for closure. The t-statistic tests the hypothesis that the coefficient equals zero, or makes no contribution to predictions on the hazard rate, againest the hypothesis that the coefficient is either

TABLE 1.2 Proportional Hazard Model: Descriptive, Congressional, and Commission Variable Effects on the Hazard Rate Function of Closure Announcements for Military Installations (1961-1995)

Dependent Variable is STUDYTIME in years

Covariates	(1) Coefficient (t-statistic)	(2) Coefficient (t-statistic)	(3) Coefficient (t-statistic)
Base Acreage	-6.23e-06 (-1.869)*	-6.00e-06 (-1.800)*	-6.02e-06 (-1.802)*
Military Function	0.4317 (2.282)*	0.4385 (2.306)*	0.4352 (2.288)*
Economic Impact	-0.0005 (-2.170)*	-0.0005 (-1.919)*	-0.0005 (-1.893)*
Persons Employed	-0.0001 (-5.216)**	-0.0001 (-5.185)**	-0.0001 (-5.198)**
Service	0.0606 (0.603)	0.0912 (0.901)	0.0917 (0.905)
Pool of Bases	0.0052 (1.729)*	0.0059 (1.864)*	0.0059 (1.852)*
Coastline	-0.0000 (-0.823)	-0.0000 (-0.787)	-0.0000 (-0.804)
House Majority Party	---	0.1137 (0.700)	0.1148 (0.706)
House Subcommittees	---	-0.8508 (-1.813)*	-0.8528 (-1.817)*
House Armed Services	---	-0.3378 (-1.562)	-0.3375 (-1.560)
House Seniority	---	0.0094 (0.984)	0.0096 (1.008)
Senate Majority Party	---	-0.0962 (-0.843)	-0.0965 (-0.845)
Senate Subcommittees	---	-0.3094 (-1.747)*	-0.3065 (-1.730)*
Senate Armed Services	---	-0.1324 (-0.791)	-0.1370 (-0.817)
Senate Seniority	---	0.0027 (0.234)	0.0030 (0.248)
Commission	---	---	-13.9270 (-0.004)
Observations	3795	3795	3795
Log Likelihood	-957.724	-952.174	-951.937
LR-statistic (χ^2)	82.69	93.85	94.27
Significance Level	0.0000	0.0000	0.0000

* Significant at least the 0.05 level (one-tailed test)
** Significant at least the 0.01 level (one-tailed test)

positive or negative.

The proportional hazard models provide evidence about the timing of base closing decisions. All of the models, as a whole, are statistically significant at the 0.005 percent level which means they are useful in explaining the timing ofmilitary installations selected for closure. In addition, five of the seven descriptive variables and two (House and Senate subcommittees) of the eight congressional variables are significant at least at the 5 percent level. Thus, these variables are useful in determining which bases will survive longer. The commission variable is not significant and does not seem to increase the hazard of a base being selected for closure.

All coefficients for the descriptive data variables have the predicted sign in all the equations. The coefficients of **acreage**, **economic impact**, and **persons employed** are negative and significant: the larger a base, the greater the economic impact of closure, or the more employees on a base then the lower the hazard of selecting the base for closure. The coefficients for **military function** and **pool of bases** are positive and significant; indicating that bases with declining missions will increase the hazard and bases located in states with the most bases in 1959 will more likely be selected for closure. The coefficient on **service** is positive but insignificant and the coefficient on **coastline** is negative, as expected, but insignificant; it seems that the difference between the owning military departments and the base location have little impact on the timing of closure announcements.

Most congressional variables yield little information

to the analysis of closure decisions. While the military subcommittee variables, **House Subcommittees** and **Senate Subcommittees**, provide some evidence to determine which bases survived in the long run, the estimations show that the other congressional variables examined do not seem to make much difference on the hazard rate.

The coefficients for the **House Armed Services** and **Senate Armed Services** Committees are negative, as expected, but insignificant; a base represented by a congressmember who serves on one of these committees may have little if any advantage from closure than a base without such representation.

Curiously, the majority party in the House and Senate may impact a base hazard rate differently. The **House majority party** variable is positive which increases the hazard rate while the **Senate majority party** variable is negative which decreases the hazard rate. However, neither variable is significant indicating that information on the majority party provides little impact on the long run survival of a base.

The coefficients for seniority in each congressional house, **House seniority** and **Senate seniority**, have positive instead of the expected negative signs; it appears that a base represented by more senior congressmembers may have shorter survival times. However, both variables are insignificant; indicating little evidence that seniority affected which bases survived.

Finally, the coefficient for the **commission** variable takes on a negative sign suggesting that decisions made by the commission lowered the hazard for a base. However, the

coefficient is statistically insignificant and does not play an important role in closure survival; apparently, the commissions had little impact on a base being selected for closure.

To summarize, in examining base closure decisions, the proportional hazard model provides evidence about the timing of base closing decisions. Specifically, descriptive characteristics (size of the base measured in acreage, changes in importance of military functions, economic impact, number of base employees, and number of bases in a state at the beginning of the study) and base representation on the congressional (House and Senate) subcommittees are useful in determining which bases will survive longer. However, neither the congressional influence represented by membership on the House or Senate Armed Services Committees, House or Senate majority party, and House or Senate seniority; nor the commissions seemed to affect the pattern of base closures.

Concluding Remarks

This essay studies the closing of U.S. military bases where policy has changed throughout the timeframe from 1961 to 1995. The interesting question addressed is what impact congressional influence and institutional changes have had on the base closure decisions. I extended previous research by employing information on the timing of base closure announcements. In addition, I included congressional influences not previously analyzed in this policy area. Using a general empirical model I examined the relationship between the base closure decision and various descriptive,

congressional, and institutional variables. The estimation procedure allowed the values of these explanatory variables to either remain constant or change over time.

The evidence presented here shows that several descriptive factors were important in determining which military bases survived in the long run. Base closure decisions were most likely to include small bases, ones with declining military missions, or bases with fewer employees. Also included were bases that would create less economic impact on a state or ones that were located in a state that had a more bases at the beginning of the study. The results confirm those highlighted in Arnold (1979) that characteristics descriptive of the base (acreage and military function) and of the constituent's interest (base employees and economic impact) are important in base closure decisions.

Of the congressional influences examined only the subcommittee variables are important. Specifically, the statistical evidence suggests that bases represented by congressmembers on congressional subcommittees in either the House or the Senate are likely to survive longer. These results supplement Arnold (1979) which only emphasized influence by House committees for closures during the period 1952 to 1974. Apparently, membership on military subcommittees (House or Senate) are important determinates in explaining which bases survived. However, the other congressional influence variables did not seem to affect which bases closed. There was no evidence that congressional influence that may be derived from Armed Services Committees, majority parties, or seniority were

important. These results suggest that, of the congressional influence studied here, subcommittee membership provides the key congressional link between interest groups and the provision of benefits in the policy area of base closures.

Interestingly, there is little evidence that the commissions significantly affected the pattern of closures. Here the estimation model takes into consideration the timing of the decisions. By considering the timing of bases selected for closure commissions do not seem to contribute to predicting the probability of selecting a base for closure. It seems feasible, as suggested in chapter one, that the commissions act as mechanisms for coordination between the executive and legislative branches and between the government and base employees. Thus, the commissions may be an institutional arrangement that strengthen base closure policy credibility instead of a mechanism to affect the pattern of closures.

Based on the results, when taking the timing of decisions of base closure decisions into account the findings suggest agents of Congress (DoD and commissions) represent the interests of the Congressional subcommittees with the most to gain/lose by the policy decisions. Also, the institutional change of establishing closure commissions did not seem to impact this linkage.

CHAPTER 3: Government Outlay Decisions: Do Categories of Federal Expenditures Crowd Each Other?

Introduction

Considerable literature analyzes the relationship between federal expenditures across states and political influence.[44] Little attention, however, has been given to the relationship between the different categories of these federal expenditures. This is surprising since the composition of federal spending continuously changes. Peltzman (1992) gives some perspective on the substantial changes over time. After adjusting for the temporary Korean War spending, Peltzman shows that from the period 1950-1959 to 1980-1988 there has been a significant shift from defense spending to domestic transfers: defense spending decreased from 51.1 percent to 25.8 percent and domestic transfers increased from 25.1 percent to 49.6 percent of total spending.

In addition to the shifting, different categories of federal spending have unique distributional implications, creating economic and political winners and losers. For example, defense spending is concentrated where military bases and defense contractors are; however, spending for highway and sewer construction grants, welfare programs, and retirement programs are distributed relatively uniformly across regions of the country (Johnston, 1980; Arnold, 1981; and National Journal, 1981). With the concentration of federal spending come economic and political gains. A change in federal spending, even if only anticipated, invariably spurs debates about the losers. For example,

announcements of military base closures and other defense spending cuts prompt much commenting by both academics and the media focusing on the impact to economic losers and the political costs to politicians.[45]

An interesting question not yet addressed in the literature is whether federal spending in one category "crowds out" spending in other categories.[46] If so, are losers of one category of federal spending receiving other kinds of spending to replace their losses (e.g., are decreases that result from base closures "replaced" with increases in other types of federal spending)? If not, does "crowding in" occur - are states continuing to receive the initial level of spending in one category and also receiving an increase in another spending category (e.g., are decreases that result from base closures "replaced" with other kinds of Department of Defense spending, such as procurement funds, and are there also increases in nondefense federal spending)? These questions relate to the broad literature that focuses on vote trading where political representatives are able to obtain mutual gains.[47] The gains, measured here by the federal funds lawmakers send "home" to the locations they represent, may help the legislators win reelection (Arnold, 1979; and Fiorina, 1989). Thus, politicians influence federal spending by participating in vote trading activities that keep dollars (benefits) going to their constituents and positively influences their electoral prospects.

This essay analyzes the allocation of defense and nondefense expenditures among states by the Federal government. I follow recent literature which focuses on the

role of both constituent interests and political institutions by examining both economic and institutional factors in determining the states' share of federal spending. In addition, I extend this empirical literature to include the role of vote trading behavior by exploring the relationship between different categories of spending allocated across states.[48] Specifically, I examine the hypothesis that composition of federal spending across states is determined by constituent interest, political-institutional structures, and vote trading behavior between lawmakers. To examine vote trading behavior I focus on whether, and to what extent, a change in one category of spending affects a change in another category - does "crowding" occur?

The empirical method used here is to estimate regressions for federal expenditures (both defense and nondefense) across states using panel data for 1981-1992. I examine constituent interests and institutional factors in determining the states' share of one category of federal spending and I also explore the effect of the another category of spending. For example, in the case where defense spending is the dependent variable I examine the impact of nondefense spending. If it is significant then I conclude there is empirical support for a "crowding" effect of nondefense spending. A negative sign indicates "crowding out" while a positive sign indicates "crowding in." Since nondefense spending is an endogenous variable the results may have a simultaneous equations bias.[49] To correct for any simultaneity bias I use two-stage least square regressions.

The findings, consistent with previous empirical evidence, suggest that defense and nondefense spending depend on both the concentration of interest groups within states and on the institutional structure of the spending decisions. In addition, there is convincing evidence that defense spending is negatively "crowded" by nondefense spending across states; suggesting positive vote trading behavior may induce a "crowding out" effect of nondefense spending on defense spending. The evidence also indicates there is no "crowding" effect of defense spending on nondefense spending; suggesting vote trading behavior may not influence nondefense spending decisions.

The next section summarizes the theoretical links of constituent interests, political institutions, and vote trading on federal spending. Then the empirical procedure is outlined and the data summarized. The empirical results are presented and a final section concludes.

The Role of Interests and Institutions and Vote Trading

Stigler (1971) inspired models based on interest group dominance. These so-called "capture" theories of politics focus on the constituent interests, be it ideological as well as pecuniary (Kalt and Zupan, 1984), that should influence the distribution of federal spending across states. The needs of the interest groups are generally concentrated in certain parts of the country, and in reaction to those needs certain categories of federal spending are also concentrated. For example, a significant portion of defense spending goes to California where there is a large aerospace industry; the midwest farm belt gets

most of the federal dollars for agriculture; a large share of social security outlays go to Florida with its large elderly population; and Mississippi and New York, both with high proportions of poor residents, receive substantial amounts of federal welfare payments (National Journal, 1976).

Besides constituent interest, institutions may also help determine political outcomes.[50] Recent empirical evidence has supported the notion that institutions play a role in influencing government spending. For example, Atlas, Gilligan, Hendershott, and Zupan (1995) find that congressional contingents from less populous states secure a significantly higher level of per capita federal spending (net of taxes and in three broad categories) for their constituents. In addition, Gilligan and Matsusaka (1995) find that states' legislative structure influences spending outcomes at state the level.

The gains-from-trade literature argues that legislatures are organized to facilitate "vote trading" behavior between lawmakers. Legislators, pursuing their reelection goals, attempt to provide benefits to their constituents. However, due to the diversity of interests they cannot succeed by acting alone. Thus, institutional arrangements such as party leaders (Koford, 1982) or the committee system (Weingast and Marshall, 1988) can help legislators generate gains from exchange and cooperation among themselves. In the logrolling literature these gains from vote trading behavior can have either positive or negative social consequences.

On the positive side, vote trading provides a mechanism

for policymakers to express the intensity of their preferences on different issues. In this case, policymakers with different constituents (and/or ideology) may be faced with a situation where acting alone - in a political institution with majority rule - they are not be able to get proposals that they find beneficial passed (the proposals do not have majority support). If these policymakers find trading partners they can exchange support and get each other's proposal passed; the participates will tend to increase their realized gain. When the increases in gains outweigh the losses to those who prefer the outcome without vote trading, then the exchange *can* result in utility gain for the entire community (Coleman, 1966; Wilson, 1969; Mueller, Philpotts, and Vanek, 1972; and Koford, 1982). It is this type of "trading" that may lead to "crowding out" of a spending category; a politician can "exchange" one government program for another.

However, on the negative side, vote trading *can* lead to too much government spending. Two examples will illustrate how this may occur. First, the case of pork barrel spending where benefits are concentrated in a specific geographic constituency and the costs are financed through generalized taxation; certain legislators obtain preferred projects by spreading the tax bill among all citizens. Here the government spending is more than optimal (Weingast, Shepsle, and Johnsen, 1981) and trade leads to the passage of programs where total benefits are less than the total costs (Schwart, 1975).[51] Second, the case where policymakers may use vote trading to inefficiently increase government size. Consider, as an example, a ratchet effect which is

considered one component of government growth (Higgs, 1987). The ratchet theory of government growth states that during time of crisis, such as war or depression, government spending increases to deal with the crises. After the crisis, spending remains above its precrisis level, creating ratchets in the growth of government spending (Holcombe, 1993). In the context of vote trading behavior, legislators can use the "extra" or temporary increases in government funding from the crisis period to permanently increase the number and type of programs it sends to the states in periods after the crisis. These negative effects of vote trading may lead to "crowding in" of federal spending categories; politicians can "bring home" additional programs (or federal spending) but not burden their constituents with the full program costs.

What role interests, institutions, and vote trading have in determining federal spending allocations across states is an empirical question and the focus of this investigation.

Empirical Procedure and Data

In this essay I examine the determinants of both defense and nondefense federal spending and explore the relationship, if any, between these spending categories. I use panel data of 12 cross sections at annual intervals beginning in 1981 through 1992. Each cross section contains all 50 states.

Basic Model

The basic model[52] for defense spending is

$$D_{it} = \alpha_i + \beta_1 GDP_t + \beta_2 X_{it} + \beta_3 P_{it} + \beta_4 ND_{it} + \epsilon_{it},$$

where i indexes states and t indexes time; D_{it} measures defense expenditures per capita; α_i is a constant term used to account for the differences across *i*; GDP_t measures the annual real growth of Gross Domestic Product and is used to capture national income effects and control for time effects; X_{it} is a vector of demographic or economic variables used to account for constituents' interests; P_{it} is a vector of political-institutional variables to account for legislative organizational influence in the allocation and composition of federal spending; ND_{it} measures nondefense expenditures per capita; ϵ_{it} is an error term; and β_1, β_2, β_3, β_4 are unknown parameters. All financial variables are expressed in constant 1987 dollars and in state per capita terms. The basic nondefense spending model is similar to the model above where ND_{it} is the dependent variable on the right hand side and D_{it} is the independent variable on the left hand side. The preceding discussion applies with these variables substituted for each other.

With panel data it is appropriate to use a fixed effects model (Johnston, 1984; and Greene, 1993). In this essay I assume the differences across states are captured with different constant terms, α_i (a dummy variable used to indicate each state), and the unknown parameters are the same for all observations.[53]

Defense Spending Model - Exogenous Variables

The variable **GDP growth** represents GDP_t, the annual real growth of national GDP. It is the same for all states

in any one year and changes over time so it should capture time effects. In addition, as GDP increases I expect defense spending allocated to each state to also increase. This income effect of demand theory assumes that defense spending is a normal good. I predict a positive relationship between GDP growth and defense spending across states.

Constituent Interests. To capture constituent interests, three variables are included in X_{it}: (i) state **income per capita,** (ii) state **population per square mile,** and (iii) annual crude **petroleum production** in the state. The first variable is commonly used to represent constituents' interest in studies of government spending (e.g., Gilligan and Matsusaka, 1995). The other two variables are used to account for defense spending on military needs associated with characteristics of a state.

The state **income per capita** variable measures the assumption that the demand for government services is related to income. On the one hand, a rich society may demand greater military spending for ensuring protection of its wealth. This explanation may account for the positive (although insignificant) relationship between defense spending and state's per capita income in the analysis by Atlas, Gilligan, Hendershott, and Zupan (1995). On the other hand, it seems equally plausible that states with low incomes may demand government expenditures (including defense spending) to stimulate its economy, thus I would predict a negative sign for this variable. Because of these inconsistencies and the large disparate literature on the precise economic impact of defense expenditures (Smith,

1987), I do not make a prediction about this variable.

The variable state **population per square mile** is included to measure the open space in a state. A densely populated state may make it difficult for the military to practice exercise and training scenarios or to test and evaluate weapon systems. In general these activities need open space, and the defense activities must compete for the use of such space in more populated states. In addition, practice and testing of weapon systems create externalities (e.g., noise, pollution, etc.) which may not be acceptable to densely populate states. Thus, I predict a negative relationship between population per square mile and the allocation of federal spending for defense.

The annual crude **petroleum production** in the state measures a raw material needed by the military. It is hypothesized that the greater the petroleum production in a state the more military spending the state receives. I predict a positive sign on this variable.

Political-Institutional. To capture the political-institutional considerations in the allocation of the defense spending across states five variables are included in P_{it}: (i) the number of **representatives** per state capita, (ii) the number of **senators** per state capita, (iii) the percentage of state representation that belongs to its **Democratic delegation**, (iv) the percentage of state representation on **House defense committees**, and (v) the percentage of state representation on **Senate defense committees**. The first three variables are similar to those used in recent analyzes of government spending to test for state representation and party effects in the allocation

decisions. The last two variables test what influence state representation on defense committees may have on the distribution of defense spending.

The variables **representatives** and **senators** are computed by dividing the number of elected officials in the House and Senate, respectively, from each state by the population of each state. These variables measure a state's per capita representation in each chamber of Congress. It is expected that states with greater representation in either chamber of Congress will obtain greater federal spending per capita. Atlas, Gilligan, Hendershott, and Zupan (1995) find that these variables are positively related to the defense spending across states. Here I also expect a positive relationship.

The variable **Democratic delegation** is a measure of party effects that may influence the defense spending across states. It is similar to a variable used in Gilligan and Matsusaka (1995) to test party effects on spending by state legislatures; it is also a variation of a control variable used in Atlas, Gilligan, Hendershott, and Zupan (1995). Here **Democratic delegation** is equal to the number of the states' Democratic officials in the House and Senate divided by the total number of representatives and senators representing the state. In general, the Democratic party is thought to direct federal spending more toward transfer programs rather than defense. I hypothesize that the larger the Democratic delegation the less defense spending obtained by the state. Thus, I predict this variable will have a negative relationship to defense spending.

The last two political-institutional variables, **House**

defense committees and **Senate defense committees**, measure the proportion of the defense committees membership representing each state in each chamber of Congress. They are used to capture the influence these legislatures may have on military spending decisions. The variables are computed by dividing the number of elected officials from each state serving on the defense committees in the House and Senate, respectively, divided by the total number of officials on each of the committees. The defense committees are the Defense Authorization Committee and both the Defense Subcommittee and the Military Construction Subcommittee of the Appropriation Committee in each chamber. It is expected that the greater the state representation on these committees the greater the defense spending in the state. Therefore, I predict a positive sign on these variables.

Nondefense Spending Model - Exogenous Variables

The variable **GDP Growth,** as in the defense spending model, measures the annual real growth of national GDP and is used to capture time and income effects. It is expected to increase as nondefense spending allocated to each state to also increases. I predict a positive sign for this variable.

Constituent Interests. To capture constituent interests, five variables are included in X_{it}: (i) state **income per capita**, (ii) state **population per square mile**, (iii) percent of state population **age 65 or older**, (iv) percent of population **enrolled in higher education**, and (v) percent of state population receiving **public aid**. These variables are used to account for the needs of a state that

nondefense spending is directed toward.

As in the defense spending model, the state **income per capita** variable measures the assumption that the demand for government services is related to income. Poorer states may demand more expenditures for human services and/or federal government expenditures to stimulate its economy. Federal programs such as those related to health, education, and income security and those related to construction of transportation systems and Federal buildings can help. I predict a negative sign for this variable.

The variable state **population per square mile** is used to measure the density of people in a state. A densely populated state may require additional federal funding for services such as commerce and housing, community development, energy, and transportation. I predict a positive relationship between population per square mile and the allocation of federal spending for nondefense.

The percent of state population **age 65 or older** is used to measure the states need for medicare, social security, and retirement expenditures. It is hypothesized that the greater the percent of population age 65 or older in a state the more nondefense spending the state receives. I predict a positive sign for this variable.

The percent of population **enrolled in higher education** variable is used to account for the federal spending on education that is send to a state. I expect that a state with higher enrollment will receive greater nondefense spending for education. This variable is predicted to be positively related to nondefense expenditures.

The final control variable is the percentage of state

population receiving **public aid** and is used to measure a states need for federal assistance funds. This variable represents the federal dollars associated with public assistance programs such as Aid to Families with Dependent Children, emergency assistance, and the Federal Supplemental Security Income that are distributed to public aid recipients. I expect a positive relationship between nondefense spending and this variable, a positive sign is predicted.

Political-Institutional. To capture the political-institutional considerations in the allocation of the nondefense spending across states, P_{it}, includes three variables: (i) the number of **representatives** per state capita, (ii) the number of **senators** per state capita, and (iii) the state representation that belongs to the **Democratic delegation**.

Representatives and **senators** measure the states' representation in expenditure decisions. As in the defense spending model, it is expected that states with greater representation in either chamber of Congress will obtain greater federal spending per capita. I predict a positive sign for both these variables.

The variable **Democratic delegation** measures Democratic party effects. The hypothesis is that the Democratic party is more likely to direct federal spending toward transfer programs. If the congressional delegation is able to obtain spending for their constituents, then there will be a positive relationship between this variable and nondefense spending. I predict a positive sign.

Crowding Effect in Both Models

To test for a "crowding" effect I focus on the independent, left hand variable - ND_{it} in the defense spending model and D_{it} in the nondefense model. In both cases, I expect the independent variable to provide evidence of whether and to what degree crowding occurs. A significant coefficient indicates vote trading behavior and the sign of the coefficient suggests if it is positive or negative. On the one hand, a positive sign would indicate that both defense and nondefense spending change in the same direction. In this essay I interpret such a relationship as negative vote trading behavior - a "crowding in" effect; a rise in one category of federal expenditures would result in a notable rise in all categories of spending. On the other hand, a negative sign would indicate that defense and nondefense spending change in the opposite direction. This is interpretated as positive vote trading behavior - a "crowding out" effect. As one category of spending decreases, then the other category of spending increases. I do not make predictions about these variables.

Two-Stage Least Squares

The independent variables for federal spending, ND_{it} in the defense spending model and D_{it} in the nondefense spending model, are endogenous and can create a simultaneity bias by their correlation with the error term (e.g., ϵ_{it} in the basic model). To correct for this simultaneity bias I use several instrumental variables which are assumed to be uncorrelated with the error term but correlated with the independent variable. For the defense spending model the

instrumental variables are the constants (α_i), all the exogenous variables in the defense equation (GDP_t, X_{it}, P_{it}), and the exogenous variables unique to the nondefense equation (**age 65 or older**, **enrolled in higher education**, and **public aid**). For the nondefense spending model the instrumental variables are the constants (α_i), all the exogenous variables in the nondefense equation (GDP_t, X_{it}, P_{it}), and the exogenous variables unique to the defense model (**petroleum production**, **House defense committees**, and **Senate defense committees**).

Data Sources

Defense and nondefense federal expenditures were collected from "Federal Expenditures by State for Fiscal Year 198X" for 1981 and 1982 data. The data for the years 1983 through 1992 were collected from the "Consolidated Federal Funds Report on CD-Rom." Defense expenditures include Department of Defense (DoD) grants to state and local governments, salaries and wages, retired military pay, procurement, and research grants. Nondefense expenditures include non-DoD grants to state and local governments, salaries and wages, procurement, and also direct payments to individuals. Not included are net interest on Federal Government debt and expenditures for selected Federal agencies (such as the Central Intelligence Agency and the National Security Agency). GDP; income; population per square mile of land; annual crude petroleum production; percent of state population (a) age 65 or older, (b) enrolled in higher education, and (c) receiving public aid; and the composition of Congress and political party

affiliation of elected officials came from various volumes of the Statistical Abstract of the United States. Membership on defense committees were taken from the various volumes of the Congressional Quarterly Almanac. The GDP Growth variable and the ratios for the variables representing per capita House and Senate representation, Democratic delegation, and House and Senate defense committees were computed from the data collected. Summary statistics for the variables are reported in Appendix Table A-3.

Empirical Results

Two regressions are reported in Table 2.1, one for defense spending and one for nondefense spending. Each is a form of the basic model using two-stage least squares (TSLS) estimation methods. The coefficients for state differences, α_i, are not reported in the set of regressions that follow; only the coefficient estimates of primary interest. Full results of each regression including all the intercept estimates are in Appendix Table A-4.

The regressions provide at least two types of evidence. First, the relevance of the variable as a determinate of the allocation of federal spending across states. This evidence is measured by the sign and significance of the coefficient estimate. Second, the regression adjusted R^2's measures the success of the regression in predicting the values of the dependent variable adjusted for degrees of freedom.[54]

Defense Spending

Column (1) of Table 2.1 presents the regression results

TABLE 2.1 TSLS Regressions for Defense & Nondefense Spending

Dependent Variable	(1) Defense spending	(2) Nondefense spending
Explanatory Variables:		
GDP Growth	11.253 (4.331)**	24.406 (4.126)**
Income per capita	0.007 (0.917)	0.054 (3.784)**
Population per square mile	-3.429 (-3.394)**	9.926 (3.969)**
Petroleum production	0.362 (1.721)*	
% of pop. age 65 or older		234.848 (9.595)**
% of pop. enrolled in higher education		1973.425 (1.034)
% of pop. receiving public aid		152.385 (6.634)**
Representatives per capita	1.95E+08 (5.556)**	5.84E+08 (7.400)**
Senators per capita	2.24E+08 (3.848)**	4.02E+08 (3.125)**
Democratic delegation	93.208 (1.407)	496.243 (4.669)**
House defense committees	-1899.212 (-2.646)**	
Senate defense committees	1074.253 (1.925)*	
Nondefense spending	-0.090 (-2.556)**	
Defense spending		-0.016 (-0.037)
Adjusted R^2	0.942	0.809
Number of Observations	600	600

NOTES: Numbers in parentheses are t statistics. A fixed effects model is employed, however only the coefficients of primary interest are reported. See Appendix for full regression results.

* Statistically significant at the 0.05 level (one-tailed test)
** Statistically significant at the 0.01 level (one-tailed test)

with defense spending as the dependent variable. The fit of the regression is very high (adjusted $R^2 = 0.94$). **GDP growth** is significant and, as expected, positively related to defense spending across states.

Of the variables representing constituent interests only **income** is insignificant, while **population per square mile** and **petroleum production** are both significant. The positive and insignificant coefficient on **income** is similar to the results in Atlas et. al. (1995). **Population per square mile**, negative and significant at the 1 percent level, indicates that densely populated states receive less defense spending. Lastly, the positive coefficient on **petroleum production** (significant at the 5 percent level) indicates that states producing more petroleum will secure more defense spending.

Of the political-institutional variables only **Democratic delegation** is insignificant. It appears that Democratic party effects (not negative as predicted) do not help the regression. On the one hand, the coefficients for **representatives**, **senators**, and **Senate defense committees** are significant and positive. Apparently residents of states with the greater per capita representation in either chamber of Congress or a greater proportion of members on Senate defense committees will secure more defense spending. However, the **House defense committees** results are curious. The significant and negative coefficient indicates that states with a greater proportion of members on these committees actually receive less defense spending. This seems counter to the results in the second essay and should be examined in future research.

Finally, turning to the variable that tests for a "crowding" effect, the coefficient for **nondefense spending** is significant (at the 1 percent level) and negative. It appears that nondefense spending has a "crowding out" effect indicating positive vote trading behavior.

Nondefense Spending

Column (2) in Table 2.1 presents the regression results with nondefense spending as the dependent variable. The fit of the regression is very high (adjusted $R^2 = 0.80$). **GDP growth** is significant and, as expected, positively related to nondefense spending across states.

Here all the coefficients for the constituent interests variables are positive and, except for **enrolled in higher education**, are significant (at the 1 percent level). States that seem to obtain greater nondefense spending have (i) higher **income** per capita; (ii) greater **population** density, or (iii) greater percent of population either **age 65 or older** or receiving **public aid**. Interestingly, **income** per capita is positively related to nondefense spending; also, percent of population **enrolled in higher education** (although with the predicted sign) does not help in explaining the spending allocations.

Coefficients for all the political-institutional variables (**representatives**, **senators**, and **Democratic delegation**) are also positive and significant at the 1 percent level. It appears that, all else equal, states with more representation per capita in either chamber of Congress or with more Democratic officials obtain more nondefense spending.

Finally, the coefficient on the variable that tests for a "crowding" effect, **defense spending**, is negative but statistically insignificant. It seems defense spending has no explanatory value and does not appear to indicate any "crowding" effect on nondefense spending - thus, there appears to be no indication of vote trading behavior.

Summary of Results

Summarizing the results of Table 2.1, in the two regressions most of the variables are relevant with predicted signs and statistically significant; and both exhibit high measures for the success of the regression in predicting the values of the dependent variables. Specifically, both defense spending and nondefense spending increase with increases in annual real GDP growth. In addition, the regressions support previous studies that show government spending depends on the concentration of interest groups and the political-institutional characteristics. Finally, there is evidence of positive vote trading behavior for defense spending but no vote trading behavior for nondefense spending. The defense spending regression provides significant evidence of this "crowding out" effect. It appears when lawmakers make defense spending decisions they exhibit vote trading behavior - "exchanging" defense and nondefense programs for each other. However, the evidence for the nondefense spending regression is not as conclusive. Even though the variable of interest has the negative sign for a "crowding out" effect it is statistically insignificant, indicating no vote trading behavior. It seems when lawmakers are making nondefense

spending decisions they do not engage in vote trading behavior.

It may seem puzzling, when considering both the defense and nondefense regressions, that there is not a symmetry to the vote trading behavior between the two types of spending in both regressions. One explanation may be that lawmakers "behave" differently when making nondefense spending and defense spending decisions because the nature of each type of spending is different. Most nondefense spending is usually a function of some type of formula (e.g., based on state population, individual demographics, or revenue sharing schemes) and considered nondiscretionary in nature. However, defense spending is generally considered discretionary. Thus, when considering defense spending lawmakers may be able to participate in vote trading behavior; "exchanging" (i.e., changing) discretionary funded programs and nondiscretionary funded programs. However, when considering nondefense spending lawmakers may be constrained by a "formula" and not able to "trade votes." It may be this type of asymmetric mechanism that is indicated by the regression results.

Conclusion

This paper examines the allocation of per capita defense spending and nondefense spending across states from 1981 to 1992. I test the hypothesis that the composition of federal spending across states is determined by constituent interest, political-institutional factors, and vote trading behavior between lawmakers. The findings suggest empirical support that both defense spending and nondefense spending

depend on the concentration of interest groups and the organizational structure of the spending decisions. In addition, there is strong empirical evidence to support a "crowding out" effect of nondefense spending on defense spending. However, the empirical evidence does not support a similar effect of defense spending on nondefense spending.

Caution should be used in interpreting these results. Although (1) the findings that defense and nondefense federal spending across states are determined by both economic and political-institutional factors are similar and generally agree with recent studies and (2) there is strong evidence that vote trading behavior occurs in defense spending decisions, the essay also raises several unanswered issues.

First, examining types of spending as a function of each other to test for vote trading behavior seems to work well when examining defense spending decisions. Why doesn't it apply to nondefense spending decisions? One possible explanation, as discussed above, is that lawmakers are restrained by use of formulas in the nondefense spending decisions. An interesting and important extension could focus on test to examine if, and how, these formulas constrain lawmaker's vote trading behavior.

Second, the relationship between House defense committees and defense spending in this essay seem to contradict the defense committee results in the previous essay. Specifically, here it seems that states with more membership representation on House defense committees actually secure less defense spending. However, in the previous essay, it seemed that membership on House defense

committees either gave the congressional districts positive or little (but never a negative) advantage in keeping defense spending - in the form of open military bases - coming into their district. What caused this apparent opposite result? Defense spending for military bases are only one component of total defense spending. Could it be that defense committee members have different influences on different types of defense spending? Future research could extend the analysis to examine the relationship between defense committee membership and different defense spending decisions.

Finally, in my discussion of a theoretical linkage between vote trading and government growth I do little more than hint at the dynamics that must occur for "crowding in" to take place over time. The model used in this essay does not address this particular channel of "crowding-in." An interesting extension could modify the model to analyze the "crowding-in" that may result over time.

Even though this essay offers some interesting insights, it also raises unanswered questions. I leave these issues for future research.

NOTES

1. This incentive compatibility problem is sometimes referred to as "dynamic inconsistency." The seminal paper on the dynamic inconsistency of policy is Kyland and Prescott (1977). See Rodrik and Zeckhauser (1988) for a nontechnical discussion of this problem in public policy. In addition, there has been considerable discussion in the literature related to both when dynamic inconsistency occurs (e.g., Strotz, 1955-56; Phelps and Pollak, 1968; Barro and Gordon, 1983; Hillier and Malcomson, 1984; Kaplow, 1986; Obstfeld, 1986; Glazer, 1989; Tabellini and Alesina, 1990; Rodrik, 1991; and Urbiztondo, 1994) and what the government can do about it (e.g., Kotlikoff, Persson, and Svensson, 1988; and Rodrik, 1989). Selective surveys of recent literature on credibility and commitment may be found in Persson (1988) and in Alesina and Tabellini (1988). Persson and Tabellini (1990) provide a more complete survey and integrate the seemingly disparate literature into a common framework.

2. See, however, Garfinkel (1990) who shows how threats and punishments can reduce the severity of this problem and thus promote a more efficient outcome. Nonetheless, threats and punishments cannot generally support a disarmament outcome.

3. The basic logic underlying this prediction of excessive protection is similar to that of Staiger and Tabellini (1987), Matsuyama (1990), and Tornell (1990) who study trade policy.

4. See Carrol (1993) who integrates these two approaches into a single framework, including both legislative and bureaucratic objectives.

5. By contrast, Garfinkel (1994) finds that disagreement within a nation governed by elected officials produces a negative bias in military spending relative to that governed by a benevolent dictator. The key assumption underlying this prediction is that the costs of such spending are realized fully in the current period, whereas the benefits are realized into the future. Though subject to some problems of interpretation, the data are consistent with the theory.

6. Twight's (1989) discussion of how U.S. military base closure and realignment policy was influenced by changes in legislation that affected the decision making process supports the notion that politics matter. But, provided that some importance is attached to economic considerations

and the welfare of military base employees in the decision making process, the government's inability to precommit will matter as well.

7. This specification is the most convenient way to capture the costs of adjustment. An alternative specification that leaves our results unchanged qualitatively assumes that workers who move are simply less productive as others and, thus, receive a lower wage. Learning by doing would imply that this cost similarly falls over time.

8. The second order condition, given by $- \alpha/(1-\mu)^2 - (1 - \alpha)/(\mu-x)^2 < 0$, is satisfied.

9. As noted below, our focus on the one-shot game is not too restrictive.

10. Admittedly, this specification is somewhat incomplete in that it applies only to the one-shot game (the one period following the shock). However, this specification can easily be extended for a more general multi-period framework. Let $e_i(t\text{-}1)$ denote the accumulation of consecutive periods of work by individual i by the end of the period t. Then, one possibility is that in time period t, $\lambda_i(t) = (\bar{e} - e_i(t\text{-}1))/\bar{e}$ for $e_i \leq \bar{e} < \infty$ and $\lambda_i=0$ otherwise. With this specification, $\lambda_L=(\bar{e}\text{-}1)/\bar{e}$.

11. Since $\alpha x < \mu^*$, the constraint that $n_1 + n_2 \leq \mu^*$ is not binding and so not explicitly stated here.

12. Under the alternative specification where the adjustment cost is reflected explicitly in the productivity of displaced workers and thus their wage, the government would pay the remaining military workers the average wage in the economy, implying the same tax rate derived below.

13. From (14), we have $F_1(n) = F_2(n) = -[\alpha /(1- \mu^*+ n)^2] - [(1- \alpha)/(\mu^*-n)^2] <0$. Since $F(n) = G(n) -(1- \lambda_L)Z$, it is clear that $G_1(n) = G_2(n) = F_1(n) = F_2(n) < 0$.

14. As noted earlier, the second-order condition, given by $G_2(n) \leq 0$, is satisfied as a strict inequality.

15. Staiger and Tabellini (1987) make a similar argument for GATT and its commitment to a policy of free trade.

16. Tornell's (1991) analysis (in the context of trade policy) suggests that subsidies can serve only as an imperfect substitute for the ability to make commitments.

17. The scope of the empirical study in this paper is restricted to the time frame from 1961 to 1995 due to data limitations. Therefore, I also limit the time periods of interest in this section.

18. Although the three periods are rather arbitrarily determined, each period can be distinguished by these characteristics.

19. Following McCubbins, Noll, and Weingast (1989), the congressional legislation used to "veto" closure proposals refers to the ex ante constraints imposed on the DoD to announce and implement base closures. In other words, Congress no longer allowed the DoD to conduct closure studies and make final announcement decisions. Constraints included legislation empowering the Armed Services Committees to review all decisions to close or realign military installations prior to any implementation action and legislative provisions prohibiting the DoD from even studying whether a base should be closed. See Twight (1989) for a detailed discussion of the rise in Congressional "veto power" over military base restructuring.

20. Defense spending data is from Stanley and Niemi (1994).

21. Information on bilatieral agreements are from Stanley and Niemi (1994). During this period, the arms control and disarmament agreements ratified by Congress included: (a) Hot Line and Modernization Agreement, 1963; (b) Accidents Measures Agreement, 1971; (c) Strategic Arms Limitation Treaty (SALT) I Interim Agreement, 1972 (d) Prevention of Nuclear War Agreement, 1973; and (e) Threshold Test Ban Treaty, 1974. The SALT I Interim Agreement expired by its terms in 1977. SALT II, scheduled to begin in 1977, was not ratified by Congress.

22. See Twight (1989) for a detailed discussion of the changing requirements the DoD had to adhere to prior to closing military bases.

23. Twight (1989) provides examples of congressional resistance to military base closures. A notable congressional response to a base identified for closure was the immediate enactment of defense bill language to prevent expenditures even to study the closure.

24. The arms control and disarmament agreements Congress ratified included: (a) Intermediate Range Nuclear Force Missiles Treaty, 1988 and (b) Strategic Arms Reduction Treaty, 1991. Also during this period the Berlin Wall fell (1989), the Soviet Union collapsed (1991), and President Bush made unilateral cuts in the U.S. nuclear force (1991).

25. Two laws were enacted establishing changes to the base closure procedures. First, the Defense Authorization Amendments and Base Closure and Realignment Act (Act of October 24, 1988, Public Law 100-526, Title II, 102 Stat. 2623) in which Congress endorsed the creation of the Secretary of Defense's Commission on Base Realignment and Closure. Second, the Defense Base Closure and Realignment Act of 1990 (Act of November 5, 1990, Public Law 101-510, Title XXIX, 104 Stat. 1808) where Congress created the Defense Base Closure and Realignment Commission for 1991, 1993, and 1995.

26. See Mayer (1995) for a detailed discussion of the relationship between Congress, DoD, and the commissions during this period.

27. See Arnold (1987) and McCubbins, Noll, and Weingast (1987 and 1989) for an informative discussion and several examples of the two general types of controls (oversight and administrative procedures) Congress has over bureaucratic decisions.

28. Collective action problems occur when the actions of members in a group are interdependent on the actions of other members of the group. For example, one member obtains benefits when another member pays the cost. To counter these problems coercion or some other special device is necessary to make individuals act in their common interest. See the seminal work of Olson (1965) and the recent synthesizes and applications in Sandler (1992). Also, see Cox and McCubbins (1993) analysis of this type of problem and solutions related to the U.S. Congress.

29. Mayer (1995) provides an excellent discussion of this argument.

30. This section relies heavily on Smith and Deering (1984), Kiewiet and McCubbins (1991), and Cox and McCubbins (1993).

31. For a discussion of the economic literature that relates to the principal-agent concept and its application to legislator-bureaucrat relations see Moe (1984). Recent studies show the application of the principal-agent theory (see Weingast and Morgan, 1983; and Weingast, 1984). McCubbins, Noll, and Weingast (1987 and 1989) describe the different instruments available to the legislative for political control of bureaucratic behavior.

32. For an extensive discussion of the role of transactions costs and the internal organization of legislatures see Weingast and Marshall (1988). Roberts (1990) develops the

theoretical arguments surrounding the roles of committee seniority and the seniority system in the distribution of federal benefits. Holcombe (1989) argues that seniority increases the legislator's ability to pass legislation for the voter's benefit, thus enhancing an incumbents ability to be reelected. Davis (1990) provides some support for this assertion with a demonstration that constituents remain loyal to a representative in part because of the benefits that a more senior member can confer as a consequence of the seniority system.

33. Arnold (1979) develops an allocation theory that explicitly includes no references to party or seniority. Instead he suggests, "Probably the best allocational strategy is for bureaucrats not to discriminate at all on the basis of party and seniority, but rather, as long as the supply of benefits lasts, to allocate generous shares to all committee members.

34. Failure rate estimation procedures (duration models) are useful to investigate the relationship between decisions made at different points in time and explanatory variables that may or may not take on different values during the study.

35. This section is based on Kalbfleisch and Prentice (1980), Lancaster (1990), and Greene (1993).

36. The simplest hazard models describe a situation of only two states and the transition from the first state to the second only occurs once. More complex models include multiple states and multiple transitions.

37. As long as the covariate is unrelated to the duration of stay in the current state, they do not bear on the question of duration dependence. The covariate is "exogenous" and can be easily incorporated into a hazard function. However, if the covariate is "endogenous" - its presence can be used to determine the duration of a stay in a state. This case raises subtle issues that impact the estimation procedure and has not been fully clarified in the literature (see Kalbfleisch and Prentice, 1980, p. 124; and Lancaster, 1990, p. 23).

38. To understand this concept it is helpful to compare models that measure duration with conventional regression models. A conventional model characterizes the mean and variance of a distribution and the regressors can be taken as fixed characteristics at the point in time or for the individual for which the measurement is taken. When measuring duration the observation is implicitly on a process that has been under way for a length of time, $t = [0, t)$. If the analysis is conditioned on a set of covariates, say $\mathbf{z}_t$, the

duration is implicitly a function of the entire time path of the variables $\mathbf{z}(t)$, where $t = [0,t)$.

39. The coefficients $\boldsymbol{\beta}$ are estimated, however the baseline hazard function, $\lambda_0(t,\boldsymbol{\beta})$, (which may have any shape) is not estimated and can take on different values for each base. Note that the hazard rate function, $\lambda(t)$, is proportional to the baseline function; it is assumed that it is the same for all bases.

40. To identify changes in the relative importance of various military missions for each Service I charted the levels of total employment at installations with the same mission category. If employment was increasing (decreasing) I assume the mission was relatively important (unimportant).

41. During the period covered in this study there are three two year intervals where no closures were announced. No observation is added to the data for these intervals. It is believed this does not change the qualitative results since the estimation model allows the number and width of the intervals to vary and since no closure information would be added to the model if observations were made for these intervals (all observations would be censored). Not including an observation for these three intervals is the same as assuming that the covariates did not change. This seems like a reasonable assumption given that the time-varying covariates change slowly and the missing intervals are enclosed by intervals where observations are available.

42. The Cox proportional hazard models were estimated with the software package STATA.

43. The data observed in the initial state are left-censored and the duration is at least the observed time. It is assumed that differences among the bases due to the number of years in the initial state are unimportant. Thus the construction of the current analysis treats all bases as though they survived for the same amount of time at the start of the study.

44. See, for example, Ritt (1976); Johnston (1978 and 1980); Anagnoson (1980); Anton (1980); Archer (1980); Ray (1980); Feldman and Jondrow (1984); Owens and Wade (1984); Anderson and Tollison (1991); and Gryski (1991).

45. Examples of academic writings include Lynch (1970), Udis (1973), National Journal (1976 and 1981), Johnston (1980), Twight (1989), and Henderson (1990). Newspaper and magazine accounts include The New York Times (1988a and 1988b), U.S. News and World Report (1963,1964, and 1988), Business Week

(1988) and Time (1989).

46. It should be noted that my reference to "crowding out" is different than that used in traditional economics. In the "crowding out" literature, the term refers to a multiplicity of channels through which expansionary fiscal policy may have little, no, or negative effects on output (Blanchard, 1987).

47. Seminal discussions of "vote trading" are found in Downs (1957) and Buchanan and Tullock (1962).

48. For example, an empirical analysis that includes vote trading, also known as logrolling, can be found in Kau and Rubin (1979). By examining Congressional votes for 1974, Kau and Rubin find that self interest, ideology, and logrolling are important in explaining the voting behavior of congressmen. The focus in this essay is not on specific votes but the consequence of legislator's actions (i.e., spending across states).

49. The simultaneity bias is due to the fact that, in a system of equations defining an economy, defense and nondefense spending are jointly determined in the government's optimization problem.

50. Institutional structures within the legislature (notably committees) that facilitate policy outcomes are discussed in Shepsle and Weingast (1981 and 1987) and Weingast and Marshall (1988).

51. It is this type of vote trading that can impose utility losses on the nontraders who would have been better off in the absence of the trade. This is the case due to negative externalities from the proposals - such as tariff bills, tax loopholes, and pork barrel public works - where a minority benefits at the expense of the majority. Here the utility losses are not outweighed by the gains to the traders, thus leading to a lowering of the community's net welfare (Buchanan and Tullock, 1962; and Riker and Brams, 1973).

52. This is a variation of two types of models used for different purposes. First, used recently by Gilligan and Matsusaka (1995), and Atlas, et. al. (1995), are models that examine the economic and political factors as determinants of government spending. The second type of model, used in the "crowding" literature (for examples see, Cebula, Carlos, and Koch, 1981; Mathis and Posatko, 1986; and Dalamagas, 1986/1987) evaluates the effect of government spending decisions upon a variety of private decisions. Here I examine constituent interests and institutional factors along with the effect of vote trading behavior between

congressional decisionmakers.

53. This is usually referred to as the least squares dummy variable (LSDV) model. See Greene (1993) for a discussion of this model.

54. R^2 is commonly used to measure the fraction of the dependent variable's variance explained by the independent variables. The adjusted R^2 is a close relative of and usually less than R^2.

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APPENDIX TABLES

TABLE A-1
Number of Bases Per State

State	Year 1959	Sample Beginning	Number of Closures	Sample Ending
Alabama	8	8	3	5
Alaska	10	9	1	8
Arizona	9	7	1	6
Arkansas	4	4	2	2
California	77	68	33	35
Colorado	9	7	3	4
Connecticut	2	1	0	1
Delaware	1	1	0	1
Florida	21	19	8	11
Georgia	20	15	4	11
Hawaii	13	11	2	9
Idaho	2	1	0	1
Illinois	14	9	5	4
Indiana	7	7	5	2
Iowa	2	0	0	0
Kansas	7	5	2	3
Kentucky	7	5	2	3
Louisiana	8	7	4	3
Maine	6	6	4	2
Maryland	11	11	2	10
Massachusetts	19	15	13	2
Michigan	9	7	6	1
Minnesota	2	1	1	0
Mississippi	5	5	1	4
Missouri	11	5	1	4
Montana	2	2	1	1
Nebraska	4	4	3	1
Nevada	5	3	1	2
New Hampshire	4	3	1	2
New Jersey	12	10	3	7
New Mexico	7	6	2	4
New York	28	16	11	5
North Carolina	7	7	0	7
North Dakota	2	2	0	2
Ohio	16	10	7	3
Oklahoma	6	6	1	5
Oregon	3	1	1	0
Pennsylvania	17	16	6	10
Rhode Island	4	2	1	1
South Carolina	9	8	3	5
South Dakota	2	2	1	1
Tennessee	5	4	1	3
Texas	44	31	16	15
Utah	7	5	2	3
Vermont	1	1	1	0
Virginia	21	16	3	13
Washington	17	10	3	7
West Virgina	1	0	0	0
Wisconsin	3	2	1	1
Wyoming	1	1	0	1
Totals	512	402	172	230

TABLE A-2
Mean and Standard Deviation of Covariates for Selected Samples of Base Closure Model

Covariates	Whole Sample	House Armed Serv	House SubComm	House Senority	House Party
Base Acreage	47743.56 (180287.8)	48150.35 (198309.3)	77344.56 (214850.9)	47784.44 (180378.2)	45806.01 (180460.)
Military Function	0.62 (0.48)	0.67 (0.47)	0.58 (0.49)	0.62 (0.48)	0.63 (0.48)
Economic Impact	542.31 (482.35)	692.72 (620.59)	514.2 (348.95)	542.67 (482.47)	514.96 (446.92)
Persons Employed	6625.46 (8755.01)	8326.81 (12282.05)	6862.66 (6940.11)	6620.47 (8756.76)	7057.32 (9452.69)
Service	2.04 (0.81)	1.97 (0.79)	2.19 (0.77)	2.03 (0.80)	2.02 (0.81)
Pool of Bases	26.33 (25.55)	24.79 (23.28)	34.08 (28.48)	26.32 (25.55)	24.48 (23.33)
Coastline	3583.04 (6182.91)	3342.87 (4565.26)	6075.29 (7064.76)	3583.99 (6185.97)	3661.84 (5907.15)
House Major Party	0.62 (0.48)	0.67 (0.47)	0.64 (0.48)	0.62 (0.48)	1.00 (0.00)
House Subcom	0.55 (0.23)	0.00 (0.04)	1.00 (0.00)	0.05 (0.22)	0.05 (0.23)
House Armed Serv Comm	0.21 (0.41)	1.00 (0.00)	0.00 (0.06)	0.21 (0.41)	0.23 (0.42)
House Senority	10.35 (8.39)	11.00 (8.59)	18.52 (9.90)	10.36 (8.39)	11.20 (9.14)
Senate Maj Party	1.17 (0.70)	1.18 (0.69)	1.20 (0.67)	1.17 (0.70)	1.26 (0.67)
Senate Subcom	0.39 (0.48)	0.30 (0.46)	0.28 (0.45)	0.39 (0.488)	0.41 (0.49)
Senate Armed Serv Comm	0.42 (0.49)	0.51 (0.50)	0.35 (0.47)	0.42 (0.49)	0.45 (0.49)
Senate Senority	13.81 (8.05)	14.64 (8.45)	13.54 (7.67)	13.81 (8.05)	14.43 (8.15)
Commission	0.28 (0.45)	0.43 (0.49)	0.32 (0.46)	0.28 (0.45)	0.27 (0.44)
Observations	3795	811	210	3791	2366

TABLE A-2 (Continued)
Mean and Standard Deviation of Covariates for Selected Samples of Base Closure Model

Covariates	Senate Armed Serv	Senate SubComm	Senate Senority	Senate Party	Commission
Base Acreage	44382.28 (179894.8)	45386.14 (169346.1)	46277.11 (177821.4)	47743.56 (180287.8)	53892.98 (192369.7
Military Function	0.60 (0.48)	0.62 (0.48)	0.61 (0.48)	0.62 (0.48)	0.61 (0.48)
Economic Impact	568.05 (489.50)	528.69 (488.17)	527.45 (438.88)	542.30 (482.35)	999.78 (626.91)
Persons Employed	7217.35 (9635.74)	6264.36 (6963.08)	6765.77 (9019.11)	6625.45 (8755.01)	8292.192 (11883.44)
Service	2.06 (0.79)	2.07 (0.81)	2.06 (0.80)	2.03 (0.80)	2.01 (0.80)
Pool of Bases	26.94 (24.06)	23.55 (23.48)	26.94 (25.60)	26.32 (25.55)	25.94 (25.44)
Coastline	2653.89 (3379.40)	3811.83 (6819.44)	3783.33 (6172.81)	3583.03 (6185.90)	3751.88 (6469.08)
House Major Party	0.66 (0.47)	0.65 (0.47)	0.65 (0.47)	0.62 (0.48)	0.59 (0.49)
House Subcom	0.04 (0.20)	0.03 (0.19)	0.05 (0.23)	0.05 (0.22)	0.06 (0.24)
House Armed Serv Comm	0.25 (0.43)	0.16 (0.37)	0.21 (0.41)	0.21 (0.40)	0.32 (0.46)
House Senority	10.35 (8.29)	10.76 (8.84)	10.64 (8.62)	10.35 (8.39)	10.55 (8.30)
Senate Maj Party	1.21 (0.63)	1.20 (0.71)	1.42 (0.49)	1.17 (0.70)	1.13 (0.71)
Senate Subcom	0.46 (0.49)	1.00 (0.00)	0.39 (0.48)	0.39 (0.48)	0.38 (0.48)
Senate Armed Serv Comm	1.00 (0.00)	0.50 (0.50)	0.45 (0.49)	0.42 (0.49)	0.44 (0.49)
Senate Senority	15.01 (8.35)	17.31 (8.87)	14.17 (8.36)	1.00 (0.00)	15.57 (8.33)
Commission	0.29 (0.45)	0.28 (0.44)	0.27 (0.44)	0.28 (0.45)	1.00 (0.00)
Observations	1611	1485	3137	3795	1089

TABLE A-3
Summary Statistics of Variables for
Defense Spending and Nondefense Spending Models

Variable	Mean	Maximum	Minimum	Std.Dev.
Federal Expenditures				
Defense spending (dollars per capita)	828.241	3013.118	121.989	536.013
Nondefense spending (dollars per capita)	2630.245	5003.696	836.785	522.015
GDP Growth Rate per year				
GDP growth	2.25	6.20	-2.20	2.18
Constituent Interests/Instrumental Variables				
Income per capita	14606.910	23150.950	9603.614	2441.965
Population per Square Mile	161.632	1042.983	0.729	226.941
Petroleum production (million barrels)	56.609	945.000	0.000	157.935
Percent of state population age 65 or older	11.939	18.400	3.000	2.187
enrolled in higher education	0.034	0.095	0.002	0.010
public aid recipients	5.525	11.800	1.600	1.944
Political-Institutional				
Representatives per capita (in Millions)	1.864	4.994	0.843	0.302
Senators per capita (in Millions)	1.092	4.976	0.067	1.092
Democratic Delegation	0.534	1.000	0.000	0.235
House defense committees	0.020	0.113	0.000	0.022
Senate defense committees	0.020	0.075	0.000	0.018

TABLE A-4
Coefficient and T-Statistic for
Defense Spending and Nondefense Spending Regressions

Variable	Defense Spending	Nondefense Spending
Alaska	872.342 (2.81)	-2265.622 (-2.74)
Alabama	-136.395 (-0.46)	-2165.929 (-4.13)
Arkansas	-680.486 (-2.51)	-2416.299 (3.66)
Arizona	-59.686 (-0.22)	-1343.549 (-2.71)
California	779.782 (2.48)	-3312.960 (-5.36)
Colorado	-73.620 (-0.27)	-823.775 (-1.84)
Connecticut	2667.033 (3.67)	-8392.306 (-4.86)
Delaware	-91.080 (-0.22)	-5594.739 (-8.84)
Florida	497.704 (1.35)	-4298.270 (-6.50)
Georgia	23.376 (0.07)	-2432.391 (-5.11)
Hawaii	1206.444 (3.95)	-3659.100 (-5.53)
Idaho	-1237.850 (-5.98)	-833.390 (-1.00)
Illinois	-266.394 (-0.73)	-3794.926 (-6.25)
Indiana	-226.954 (-0.68)	-2845.277 (-4.89)
Iowa	-986.245 (-3.58)	-2314.675 (-3.03)
Kansas	-402.278 (-1.56)	-1912.086 (-3.42)
Kentucky	-470.875 (-1.57)	-2377.489 (-4.07)

TABLE A-4 (Continued)
Coefficient and T-Statistic for
Defense Spending and Nondefense Spending Regressions

Variable	Defense Spending	Nondefense Spending
Louisiana	-424.919 (-1.53)	-2569.181 (-4.95)
Maine	-480.880 (-2.15)	-2375.667 (-4.78)
Maryland	1883.506 (3.46)	-4808.843 (-4.08)
Massachusetts	2648.088 (3.20)	-9254.567 (-4.97)
Michigan	-436.201 (-1.27)	-3467.127 (-5.84)
Minnesota	-645.503 (-2.29)	-1842.179 (-2.89)
Mississippi	-176.820 (-0.63)	-2747.713 (-5.90)
Missouri	436.215 (1.50)	-2101.649 (-4.40)
Montana	-1478.789 (-7.34)	-1757.481 (-1.96)
Nebraska	-934.498 (-3.86)	-1768.178 (-2.45)
Nevada	-998.934 (-4.82)	-933.986 (-1.35)
New Hampshire	-375.997 (-1.49)	-2849.699 (-6.09)
New Jersey	2835.668 (2.63)	-11984.34 (-5.25)
New Mexico	-384.986 (-1.71)	327.256 (0.64)
New York	666.115 (1.37)	-5393.976 (-6.57)
North Carolina	-145.433 (-0.44)	-2865.132 (-5.13)
North Dakata	-1088.316 (-6.14)	-1563.293 (-2.07)

TABLE A-4 (Continued)
Coefficient and T-Statistic for
Defense Spending and Nondefense Spending Regressions

Variable	Defense Spending	Nondefense Spending
Ohio	194.795 (0.47)	-4375.130 (-6.69)
Oklahoma	-483.007 (-1.82)	-2056.318 (-3.48)
Oregon	-978.214 (-3.69)	-1621.839 (-2.10)
Pennsylvania	229.915 (0.57)	-4344.062 (-6.51)
Rhode Island	2295.255 (2.33)	-11694.30 (-5.80)
South Carolina	-71.593 (-0.23)	-2258.515 (-4.52)
South Dakota	-1293.728 (-7.09)	-1793.983 (-2.13)
Tennessee	-500.638 (-1.60)	-2321.335 (-3.81)
Texas	-221.855 (-0.86)	-1564.515 (-3.15)
Utah	-382.441 (-1.60)	-398.441 (-0.80)
Vermont	-1133.307 (-4.65)	-4084.285 (-6.25)
Virginia	1598.198 (5.60)	-987.097 (-1.46)
Washington	216.557 (0.75)	-1755.324 (-3.93)
West Virgina	-1065.146 (-3.73)	-3013.463 (-4.02)
Wisconsin	-763.076 (-2.54)	-2780.522 (-4.23)
Wyoming	-1667.512 (-12.65)	-1286.470 (-1.42)
GDP Growth	11.253 (4.33)	24.406 (4.12)

TABLE A-4 (Continued)
Coefficient and T-Statistic for
Defense Spending and Nondefense Spending Regressions

Variable	Defense Spending	Nondefense Spending
Income per capita	0.007 (0.91)	0.054 (3.78)
Population per square mile	-3.429 (-3.39)	9.926 (3.96)
Petroleum production	0.362 (1.72)	
% of pop. age 65 or older		234.848 (9.59)
% of pop. enrolled in higher education		1973.425 (1.03)
% of pop. receiving public aid		152.385 (6.63)
Representatives per capita	1.95E+08 (5.55)	5.84E+08 (7.40)
Senators per capita	2.24E+08 (3.84)	4.02E+08 (3.12)
Democratic delegation	93.208 (1.40)	496.243 (4.66)
House defense committees	-1899.212 (-2.64)	
Senate defense committees	1074.253 (1.92)	
Nondefense spending	-0.090 (-2.55)	
Defense spending		-0.016 (-0.03)
R^2	0.947	0.827
Adjusted R^2	0.942	0.809
Durbin-Watson Stat	1.912	1.878
Number of Observations	600	600